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Abstract

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Service Learning: A Case Study in an Agricultural Communications Course

Danna B. Kelemen, D. Dwayne Cartmell II, and Shelly Peper Sitton

Abstract

Academic service-learning can be an effective and successful educational tool across many disciplines. The benefits afforded students and the community they serve are reciprocal in nature, thereby providing service to the community and capitalizing on a real-world learning environment for the students. Agricultural communications programs can offer for service-learning opportunities within the academic arena. The Campaign Planning for Agricultural and Natural Resources course at Oklahoma State University captures the essence of service-learning and provides students with an opportunity to use knowledge gained in previous courses to develop usable communications campaigns for small businesses or organizations. This case study should serve as a starting point for service-learning research in agricultural communications.

Introduction

Undergraduate students pursuing degrees in agricultural communications are offered a variety of courses designed to prepare them for careers in the agricultural and natural resources industry. Many times the courses provide a theoretical framework for communications application, but they do not allow students to gain hands-on, real-world experience. Communications professionals know “actions speak louder than words”; therefore, allowing students to gain real-world experience makes a service-learning course in agricultural communications truly beneficial.

The concept of service-learning can be an effective teaching method that enables students to recognize the relationship between learning and life experiences (Prentice & Garcia, 2000). The idea of service-learning dates back to philosophers John Dewey and Jean Piaget, who believed learning occurs best when students are actively involved in their own learning and when the learning has a distinct purpose (Billig, 2000). Waterman (1997) stated students develop a more thorough understanding of and an appreciation for the academic material taught if they are able to apply what they’ve learned in a manner that makes a difference in their own lives or that of others. In addition, service-learning for a student preparing to enter the job market has distinct benefits. Prentice and Garcia (2000) affirmed students are not only able to explore career opportunities through service-learning, but also they enhance their interpersonal skills and academic learning as a result of the experience.

The term service-learning encompasses many different definitions as it relates to the fusion of learning and service. At the secondary level, hands-on experience coupled with knowledge-based learning addresses both sides of the educational coin. Jacoby (1996) defined service-learning as follows:

As a pedagogy, service-learning is education that is grounded in experience as a basis for learning and on the centrality and intentionality of reflection designed to enable learning to occur. Reflection and reciprocity are key concepts of service-learning. (p. 5)

Additionally, the National and Community Service Trust Act of 1993 (Corporation for National & Community Service) stated service-learning combines student learning with service to a community so both community and student are improved. This document defines service-learning as a teaching method in which students or participants learn and develop through active participation in thoughtfully organized service that is conducted in and meets the needs of a community; this service activity must be:

- coordinated with an elementary school, secondary school, institution of higher education, or community service programs, and with the community;
- designed to foster civic responsibility; and
- integrated into and enhances the academic curriculum of the students or the educational components of the community service program in which the participants are enrolled.

Following the activity, the organizers must provide structured time for the students or participants to reflect on the service experience (Corporation for National & Community Service, 1993).

In reference to noted experiential-learning theorists Dewey, Piaget and others, learning occurs through a cycle of action and reflection and is not merely rote recitation of fact. Eyler and Giles (1999) noted the easiest way to understand service-learning is to address the central claim of the theory, which was stated by Honnet and Poulen (1989): “service, combined with learning, adds value to each and transforms both” (p. 1).

Higher education has long been charged with the tradition of service. In fact, the triad mission of land-grant colleges and universities encompasses service along with research and teaching. Speck (2001) stated service-learning is a way to overcome the barriers presented by traditional education that separates students from participation in public life and fails to provide them with the necessary skills and knowledge needed to attain such involvement. Using real-world projects to attain authentic experience within service-learning can serve only to strengthen its attributes. Schuldt (1991) stated a real-world project is cultivated by the instructor, can be individually or group-based, and allows the students work with a client in an organization.

Bringle and Hatcher (1995) stated academicians have general agreement that service-learning entails:

A course-based, credit-bearing educational experience in which students (a) participate in an organized service activity that meets identified community needs and (b) reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility. (p. 112)

While the definitions of service-learning fluctuate among scholars, advocates argue that for service-learning to be legitimate, ethical and useful, it must adhere to certain criteria (Butin, 2003).

These integral criteria are respect, reciprocity, relevance, and reflection. Butin (2003) stated respect of the circumstance and outlooks of those being served must be foremost in a service-learner's mindset. The reciprocity of service-learning should be highly apparent; not only should the service benefit the server, but also those being served should determine what the service should entail (Butin, 2003). In addition, the service must be relevant to the course in which it is occurring (Butin, 2003). Finally, reflection of the service provided must occur for context and meaning to be construed by the student participating in service-learning (Butin, 2003).

Eyler and Giles (1999) found students believed learning received via service-learning experiences was more applicable to real-world contexts and richer than material learned in traditional classes. Thus, students developed a personal connection between the information they learned within the classroom and the application of these skills outside the classroom and within the community. Butin (2003) stated service-learning can "enhance student outcomes, foster a more active citizenry, promote a scholarship of engagement among teachers and institutions, promote a more equitable society, and reconnect K-16 schools with their local communities" (p. 1675). Likewise, in the field of engineering, real-world projects in conjunction with NASA and the Universities Space Research Association were found to be a conduit to link classroom learning to experience in the real world (Bak, 1992). Thus, academic service-learning today continues to serve as an effective method of juxtaposing classroom learning with real-life applicability.

Methods

According to Bogdan and Biklen (1998), a case study provides a detailed examination of a single setting, subject, depository of documents, or particular event. Case studies vary in their type and principles, yet each serves as a research approach to studying a specific and unique situation. This case study examined service-learning and a particular course in agricultural communications.

The researchers used a qualitative case study as they sought to understand the educational theory of service-learning in the agricultural communications discipline. In addition, it was an observational case study, one in which the major data-gathering was accomplished through participant observation and the focus of the study was on a specific organization or some aspect of the organization (Bogdan & Biklen, 1998).

Merriam (1998) stated, "the single most defining characteristic of case study research lies in delimiting the object of study, the case" (p. 27). In this research study, the case was AGCM 4403: Campaign Planning for Agriculture and Natural Resources, which has been taught at a Oklahoma State University since 2003 and has an typical enrollment of 25 to 40 students. The boundary of this case was one semester, or a four-month period. The 25 students registered in the course served as the participants; all were agricultural communications majors within the College of Agricultural Sciences and Natural Resources.

The lead researcher approached this study as a graduate student enrolled in the course and had several years of experience in communications campaign development and planning as well as nine years of experience in the agricultural communications industry; however, she had a limited educational base in the course content. Merriam (1998) noted the researcher must draw upon "concepts, terms, definitions, models and theories of a particular literature base" (p. 46) to develop and conduct a case study properly. The canon of literature for this study was related to service-learning and experiential education.

The campaign-planning course was taught by a seasoned instructor with multiple years of professional experience in planning communications campaigns and had served as the instructor for the course since its inception. The course was interactive in nature, with the instructor challenging the students to apply campaign planning theory and guidelines learned through texts to their real-life campaigns. The 25 students enrolled in the course were divided into three- or four-member teams based upon their self-appointed strengths and areas of like and dislike with regard to communications activities. Based on the number of groups, an appropriate number of clients were identified in the community and around the state who desired a communications campaign to facilitate their new businesses or ventures. The students met as a team with their clients and received all necessary information regarding the respective businesses and their goals. Upon completion of the communications campaign, the teams presented their campaigns to the clients, and the clients could implement the communications campaigns based on the students' suggestions. The teams were graded on the various aspects of their developed campaign plans, peer and client feedback, and overall quality of work.

The design of the course facilitated students emulating a communications team in a professional setting. Each student team submitted weekly memoranda to the course instructor, updating her on the team's progress and timeline of plans. Students took weekly quizzes based on their readings from a campaign-planning textbook. Additionally, each team developed a team name, slogan and letterhead, creating a real-world scenario for the project. The teams completed a three-part analysis of the client — industry, competitive and company — that guided the development of a campaign. The teams also produced a budget as well as sample communication materials for review during the final presentation to the client.

Stake (1978, p. 5) stated, "Case studies will often be the preferred method of research because they may be epistemologically in harmony with the reader's experience and thus to that person a natural basis for generalization." Qualitative data was collected through the course syllabus, course materials and their delivery, student-instructor interaction, student perceptions, student assignments, client interaction, participant observation in the course, and course evaluations. The researcher participated in the course as a graduate student and observed both the educator and the students. The researcher approached the course with considerable objectivity, having experience in campaign development and planning but having received limited formal training in the area. The researcher observed the educator and the students in a classroom setting as well as in group interactions and professional presentations. Campbell & Stanley (1963) argued the likeness of a study's setting to its natural environment lends to increased validity and overall generalizability of findings. The methods of information collection were chosen by the researcher based on the environment of the course and students. The researcher used observation notes, course-evaluation comments, and the course syllabus to observe common instances, or patterns, related to service-learning.

Looking for patterns within collected information serves as a "major mode of analysis" (Tellis, 1997, p. 1). Closer examination of the data and for the development of patterns allows the researcher to adequately describe the events in a case and can lead to a better understanding of a case. Because this is a descriptive case study, "the predicted pattern must be defined prior to data collection" (Tellis, 1997, p. 1). Garsen (2003) agreed with this principle and described the development of patterns as the attempt of the researcher to show links to the theoretical model, which drives the case study. The predicted pattern or theoretical model in this case was the criteria established by Butin (2003) as respect, reciprocity, relevance, and reflection.

While searching for patterns among the notes, course-evaluation comments, and the syllabus, the researcher worked alone to find repetitive comments made by students about objectives outlined in the syllabus and catalog description of the course. Patterns were identifiable through observation and the use of a tally marks to record each observance, which the researcher to make note of similar comments as they occurred in the classroom as well as in course evaluations. In addition, the service-learning criteria of respect, reciprocity, relevance, and reflection were examined with regard to the course syllabus to determine if they were present from the onset of the course and served as framework on which the course was based.

Results and Discussion

In reviewing the syllabus, the campaign-planning course allowed students to learn how to create a communications campaign for any organization. The course developed a student's ability to convey written and oral information, use multiple media, work as a professional and team player during a campaign, conduct market research, and use the knowledge gained in planning a campaign. Students were grouped into teams and were instructed to develop a functional communications campaign for a client.

Through the course and its service-learning assignments, students used the knowledge gained in other courses throughout their college career to create a usable communications campaign for a client, as observed by the researchers through student presentations, course evaluations, and client materials. Students refined their individual abilities and worked with other students with differing levels of talent and skills. In providing materials for each client, students developed portfolio-building materials for themselves. Students used their skills in a real-life situation comparable to what they would experience in the workplace. In addition, the clients received an actual communications campaign plan with appropriate research and products to use at their discretion. Ultimately, the students produced tangible, real-life projects worthy of professional utilization.

In justifying the agricultural communications course as a service-learning course, the definition set forth by the National and Community Service Trust Act of 1993 was used. The first guideline looks at student participation in service that meets the needs of the community. In this course, the clients approached the instructor of the course in search of quality workmanship at a minimal or gratis cost, thereby allowing the students to participate in a genuine service-learning opportunity and contribute to the community. Specifically, the clients were in search of student assistance regarding the development of communications campaigns for their businesses. While many of the clients were owners or principal stakeholders in new businesses, several of the businesses were established and looking for assistance in the revitalization of their communication outreach plans. The clients outlined the goals for the assigned student teams, but students were active participants in determining why the client felt a certain goal or vision should be achieved. As Schuldt (1991) confirmed, in real-world projects the students must identify succinctly the needs and expectations of the client so the project meets his or her overall needs and the client is duly satisfied with the end product. In fulfilling the second guideline, the course was offered at an institution of higher education and assisted businesses in the community surrounding the university. By nature of the interactive relationship between student teams and clients, the clients served to foster civic responsibility. The clients and students contributed to the well-being of community in a reciprocal fashion. The use of service-learning in this course enhance the students' skills and applicability by allowing the students to exercise their skills for actual clients in a professional setting. Schuldt stated the use of real-world projects affords

students “practical experiences that enrich the students’ academic experiences in a relatively safe environment free from job security concerns” (1991, p. 35). In addressing the final guideline of allowing for student reflection, the students in the course submitted weekly memos regarding their campaign experience as well as participated in class discussion and laboratory sessions where the campaign experience was discussed as a whole. Most importantly, students used critical thinking skills to assess themselves and their teammates regarding their project. While student grades in the service-learning course were determined in a multifaceted basis, students indicated they reflected upon their communication plans thoughtfully before grading their teammates and ultimately themselves in an unbiased and truthful manner. Although this type of assessment may not be the norm in the real-world, the ability to think critically and arrive at thoughtful and intelligent decisions are skills learned and expanded upon as a result of the course.

Additionally, the findings of the study examined the four criteria given by Butin as essential for service-learning. The findings are based upon the assignments and instructions given to the students in class as well as the students’ interaction with the client. The first criterion explores the notion of respect and involves the students’ overarching goal for the course: creation of a communications plan for a real-world client. The students were instructed to create a plan for their client that solved a central and existing problem addressed by the client. The instructor of the course emphatically reminded students they were serving the client and in doing so gaining valuable real-life experience based upon their skills learned as agricultural communications students. In many cases, the researcher noted students indicating the client was not acting in their own best interest, yet they were forced to be respectful of the client’s wishes and only address the problem(s) highlighted by the client. Working in teams also allowed the students to work with peers with differing ideas and skill levels, similar to that which would encounter in a professional setting. Therefore, the notion of respect is primary in affording students the opportunity to gain real-world experience that could not otherwise be gained through a typical classroom setting and learned set of skills.

The relationship of reciprocity goes hand-in-hand with respect for the client. The students in the course gained valuable experience in the application of their skills in designing a communications plan, yet the client being served set the framework for the students. This reciprocity enables both student and client to benefit from the course and the material being taught, thereby illustrating the service the students provided and the learning that took place.

The relevancy of any service is fundamental for learning to occur. The campaigns course provided students with an opportunity to use the knowledge gained in other courses throughout their college careers to develop usable communications campaigns for clients. The design of the campaigns course created a framework for the bigger picture of service the students are providing to the clients. Through weekly readings, assignments, meetings, and expert referral, the students were measured as to the service they were providing. In the end, the clients chose the communication plan that best met their needs, the instructor evaluated the students based on pre-determined criteria, and the students evaluated one another on performance.

Reflection is essential to the process of service-learning. Conrad and Hedin (1991) stated reflection allows students to develop a wholly substantial viewpoint that extends beyond their individual service-learning projects; it allows them to see their individual changes about their own ideas and beliefs. For effectiveness, the students must reflect on what they have learned throughout the course and on how the skills impact them in the future. In the campaigns course, students reflected throughout the duration of the course on the context and meaning of their tasks in developing communications

plans. Student teams submitted weekly memos on their progress, completed supplemental readings and quizzes to test their knowledge of campaign planning, developed client products, developed a detailed budget, and presented their completed communications plan to the client, instructors and peers for evaluation. Additionally, students played an active role in planning the syllabus of the course and determining the goals to be met at culmination. Each of these content areas allows for extensive reflection throughout the duration of the course and ultimately led to a thorough and honest evaluation of their work.

The overall findings of the study are parallel to the theory and principles behind academic service-learning. Each of the four criteria was addressed in detail within the course and support the positive outcomes derived by students and clients alike involved in this service-learning opportunity.

In this case study examining service-learning in an agricultural communications course, student comments were indicative of learning how the course met the guidelines for service-learning and determining what needed to be improved upon in the future. Derived from course evaluation, the thematic table (see Table 1) summarizes the findings related to the course overall, its workload, and its benefits for students as they relate to achieving service-learning.

Table 1

Thematic Conceptual Matric of Course Values Related to Service-Learning

Value	Theme	Illustrative Quotes
Course	1. Worthwhile	"The course was fun and worth my time."
	2. Learning	"I learned a lot in this course."
Workload	1. Prerequisites	"Everything was an excellent learning experience."
		"Prerequisites should be established/enforced."
	2. Credit Hours	"I saw times where groups were unequal."
		"Wow! We did a lot of work. It should be worth four hours."
Student Benefit	1. Real-world Experience	"A lot of work is required outside of class."
		"Helped to see what goes on behind the scenes and opens eyes."
		"I liked having guest speakers, they brought real world to the class."
		"It helped with teamwork and to prepare for the real world."
		"I am walking away with a lot of confidence in knowledge acquired."

The findings of this study indicate the Campaign Planning for Agriculture and Natural Resources course was indeed an effective portrayal of a service-learning course in agricultural communications at this midwestern land-grant institution. Students involved in the class generally had positive feelings toward the course overall and the benefits afforded them. In particular, students found the course to be beneficial because it left them with more confidence and knowledge in communications planning. Students stated they learned a lot in the course and it helped to prepare them

for the real world. Based on student and client evaluations and feedback, service-learning does prove to be worthwhile for students in a campaigns course. Clearly, based on the literature and the outcomes of this study, service-learning is an effective teaching strategy to use in some agricultural communications curriculum.

Summary

As students attend college before entering the workforce, it is imperative these students be equipped with the skills necessary to succeed. While part-time employment and internship opportunities provide excellent experience for the traditional college student, more real-world experience is necessary to afford them the competitive edge in the job market. Academic service-learning with its real-world experiences fills the void often left from traditional coursework. In agricultural communications, in particular, service-learning is an effective tool for combining marketing, communications, public relations, and journalism knowledge with practical application. As the agricultural communications discipline continues to grow, it will be imperative for students to not only grasp the multitude of skills necessary to succeed in industry but also to have the confidence and know-how of applying the skills in realistic situations. Through service-learning, students have input in the end result of their work as well as a direct impact on the lives of others.

This case study should serve as a starting point for future research in the area of service-learning within agricultural communications coursework. Other denoted “capstone” courses should be examined within the discipline to determine if criteria could be added to make these service-learning in nature, as well. Additional studies should be conducted that not only use participant observation and anonymous evaluation but also incorporate students’ perspectives through interviews and additional evaluation tools. While the case study method was fruitful in examining this particular course, content analysis of assignments, the course syllabus, and student evaluations would ensure objectivity and avoid potential researcher bias. Further studies should be conducted to determine if service-learning is appropriate in all areas of agricultural communications and to delineate the specific benefits gained through participation in such a course.

Service-learning is a judicious method of combining learning and service. The challenge ahead lies in structuring the activities to ensure students and clients reap the maximum benefits of real-world experience afforded through such an opportunity.

Keywords

service-learning, capstone courses, teaching, case study

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Impact of Reporter Work Role Identity on News Story Source Selection: Implications for Coverage of Agricultural Crises

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Abstract

This study examined coverage of the December 2003 bovine spongiform encephalopathy (BSE) event to discover impact of reporters' work role identities on news story source choices and to explore implications of results for agricultural crisis coverage. Content analysis was performed on 62 stories from U.S. newspapers in the Lexis Nexis database, selected through keyword search December 23, 2003 through October 31, 2004. These stories were divided into two equal groups based on reporters' work-role identity (dichotomized between science-specialty beat reporters and non-specialty reporters) and analyzed by length, number of sources, and source variety. ANOVA and bivariate correlation statistics were used. Results indicated no statistically significant differences in mean story length or mean number of sources for stories written by science-specialty beat reporters and those written by non-specialty reporters. However, while mean overall source variety did not differ between the two reporter groups, work-role identity correlated with use of scientists and agricultural scientists as sources: science-specialty beat reporters used more such sources than did non-specialty reporters. Although this study was limited by small sample size and restriction to the first U.S. BSE event, the above findings may prove useful to agricultural public information officers and media relations practitioners in "pitching" stories and sources for similar agriculture-based crises. In particular, this study addresses priorities stated in the National Research Agenda -- the desire of agricultural communicators to "aid the public in effectively participating in decision-making related to agriculture," through providing information on which such decisions can be based (RPA2, 2007-2010, p. 4).

Introduction and Review of Relevant Literature

In December 2003, the first case of bovine spongiform encephalopathy — known as BSE or "mad cow disease" — in the United States was discovered in a cow in Washington state. That the sick cow had been destined to be processed into hamburger meat to be used by McDonald's franchises added impact to a fascinating and potentially frightening story. U.S. newspaper coverage of this story unfolded over the course of the next year, as reporters consulted various types of sources to help them explain the facts of this scenario to their readers.

In covering such stories, reporters' abilities to identify and successfully use appropriate news sources are paramount to effective, reliable news coverage. Complex stories like the December 2003 BSE event lie outside the everyday experience of most reporters and require knowledge beyond their usual areas of expertise. The identification of knowledgeable sources and the scrupulous attribution of the information they provide are crucial to the accurate telling of such science-intensive stories; reporters must identify and accurately report the "right" sources to explain such matters to their read-

ers (Albaek, Christiansen, & Togeby, 2003; Ashlock, Cartmell & Kelemen, 2006; Borchelt, 2008; Irlbeck, 2009; Lee, 2004).

Several authors have posited that source choice may be driven by agenda-setting competition among issues, including the “news wave” that influences reporters themselves, and/or may reflect effects of framing. It is generally accepted that opinion leaders help define those issues about which the public should think (Dearing & Rogers, 1996; McCombs & Shaw, 1976; McQuail, 1994) and that the media helps communicate such agenda salience (Ashlock, Cartmell & Kelemen, 2006; Holland, 2009; Peters et al., 2008). Reporters’ selection of sources plays an important part in agenda setting because story sources can drive issue discussion in particular directions.

Framing, on the other hand, helps guide the public as to how it should think about a particular issue. Framing provides context for opinion formation and discussion (DeFleur & Ball-Rokeach, 1989; McQuail, 1994). A story frame is built around a reporter’s concept of newsworthiness, comprising such factors as conflict and proximity, as well as that reporter’s sense of the story’s contextual salience. Frames developed by reporters help to construct schema to help the public place issues into understood and shared contexts (Ashlock, Cartmell & Kelemen, 2006; Ruth, Eubanks & Telg, 2005). Reporters themselves are susceptible to agenda setting and framing of issues through the coverage of such stories by media they regard as particularly prestigious and credible (Breed, 1955; Dunwoody, 1979; Havick, 1997; Ten Eyck, 2000). Agenda-setting and the news waves of arterial effects (Breed, 1955) it generates may mean reporters are forced to adopt others’ frames via consulting the same or similar sources.

Agenda-setting theory accepts the proposition that opinion leaders set public perceptions about which issues are important to consider. Agenda-setting theory further contends that issues of public salience comprise agenda for action, with media input helping to define issue content and relative importance (McQuail, 1994). Agenda-setting may be seen as a process of issues and their proponents competing for reporters’ and editors’ attention, as well as for the attention of decision-makers and the public (Dearing & Rogers, 1996). In the context of this struggle for control of limited media time and space, source choice becomes paramount (Ashlock, Carmell & Kelemen, 2006; Irlbeck, 2009), as each particular source may drive issue discussion in a particular direction, skewing the agenda presented as important to the public. Editors and reporters themselves may also be influenced by a type of agenda-setting that Ten Eyck (2000) and Havick (1997) called the “news wave,” the tendency of media to deem important those stories first covered by prestigious news outlets.

Agenda setting and framing of particular events both may be influenced by reporter/editor and newspaper characteristics. Source selection plays a major role in constructing media agenda and frames, with agenda-setting theorists maintaining that reporters choose their sources based on the agenda their newspapers seek to advance (Dearing & Rogers, 1996) and that sources contribute in major ways to constructing story frames (Ashlock, Cartmell & Kelemen, 2006; Irlbeck, 2009; Zoch & Turk, 1998). Additionally, agenda and frames may evolve over the course of an ongoing story, with sources changing to match that evolution as a story “matures” (Chyi & McCombs, 2004; Sumpter & Braddock, 2002; Martin, 2003). While this article does not explore news selection variables and their relationship to framing and agenda-setting per se, it does use those theoretical ideas to help select variables that should be studied.

Those concerned with the source choices of reporters covering the December 2003 BSE event and with the impact of such sources on the quality of information available to the public may look to an extensive body of research on the factors that influence the sourcing of breaking agricultural

reporters' relationships with their sources, and the relationships between science-specialty-beat reporters and their sources.

The amount of coverage afforded agriculture by newspapers, both in numbers of stories and in extent of column inches, has declined over the past several decades, largely because of the increasingly urban nature of American life (Hays, 1993). Other factors contributing to this decline include indications that agricultural producers and scientists may not turn to newspapers as their preferred medium of information exchange (Bouare & Bowen, 1990; Bruening, 1991; Bruening & Martin, 1992; Bruening, Radhakrishna, & Rollings, 1992; Dunwoody, Brossard & Dudo, 2009; Lundy, Ruth, Telg & Irani, 2006; Oskam, 1992; Reisenberg & Gor, 1989, Rollings, Bruening, & Radhakrishna, 1991) and that most newspaper reporters possess low levels of agricultural literacy (Haygood, Haggins, Akers, & Keith, 2005; King, Cartmell & Sitton, 2006). Existing coverage of agricultural topics has concentrated on controversy and risk, with positive stories receiving little play (Beaudoin & Thorson, 2004; Ruth, Eubanks & Telg, 2005; Ten Eyck, 2000). Other researchers note that newsmen's routines and newsrooms' structures have not been conducive to covering agricultural news (Logan, 2001).

Into this climate of inattention to agricultural news burst BSE, a new and little-understood disease that met the criteria of controversy and risk so prized by journalists. First emerging in the United Kingdom in the early 1990s, BSE generated a large amount of emotionally-charged coverage in Europe (Sturloni, 2003; Washer, 2005), with subsequent outbreaks in Japan and the United States gaining attention from the press because of the potential economic, social, cultural, and geographic impacts of the disease (Ashlock, Cartmell & Kelemen, 2006; King, Cartmell & Sitton, 2006; Ruth & Eubanks, 2005; Ten Eyck, 2000). Researchers have criticized the media for failing to report accurately about BSE and other zoonotic diseases (Peters et al., 2006; Roche & Muskavitch, 2003) and often exaggerating its immediate risks to humans (Raude, Fischler, Lukasiewicz, Setbon, & Flahault, 2004). Such reports caused decreases in beef consumption and, in the short term, hurt the U.S. beef industry (Ashlock, Cartmell & Kelemen, 2006; King, Cartmell & Sitton, 2006; Ruth, Eubanks & Telg, 2005; Schupp, Gillespie, O'Neil, & Prinyawiwatkul, 2004). Although several years have passed and other agricultural crises, such as the 2008 salmonella outbreak in produce imported from Mexico, have usurped BSE's media prominence, it is precisely because of BSE's novelty to both U.S. reporters and media consumers in 2003 and its impact on U.S. agriculture that the country's first BSE event was chosen as the focus of this study.

Even before the 2003 BSE event, however, much research had been devoted to investigating the source selection process, a job function common to all reporters. Studies focused on, among other topics, the role of information subsidies (Borchelt, 2008; Gandy, 1982); the gatekeeping role of newspaper editors (Schmierbach, 2005; Donohue, Olien, & Tichenor, 1989); the part played by reporters' and editors' personal characteristics (Armstrong, 2004; Shoemaker, Eichholz, Kim, & Wrigley, 2001); and the contribution of newsmen's organizational routines (Clark & Illman, 2003; Dunwoody, 1979, 1980; Kitzinger & Reilly, 1997; Nisbet & Scheufele, 2009). Perhaps chief among the comments that can be made about these studies is that (a) all such studies identify these factors as playing a part in how reporters select sources but (b) they do not often agree on the nature or the degree of influence exerted on source choice by each of them.

Researchers have noted that coverage by science-specialty-beat reporters differs from that by general assignment reporters in quantity, type, and tone (Craft & Wanta, 2004; Long, 1995; Shoemaker, Eichholz, Kim & Wrigley, 2001). Other studies concentrating on relationships between specialty-beat reporters and their sources found that such reporters often use the same sources con-

tinually, building strong bonds with them (Chermak, 1995; Dunwoody, 1979; Gandy, 1982; Holland, 2009; Ten Eyck, 2000) and often focusing almost exclusively on institutional representatives who may be depended upon to furnish information (Ericson, Baranek, & Chan, 1993; Sumpter & Braddock, 2002). Other researchers have called for media to concentrate to an even greater extent on scientists as sources for complex stories (Dunwoody, Brossard & Dudo, 2009; Holland, 2009; Ramsey, 1999), although they note that a reporter's ability to deal effectively with such expert sources may depend heavily upon that reporter's science training (Grantham & Irani, 2004; Vestal & Briers, 1999; Wingenbach, Rutherford, & Dunsford, 2003).

Thus, newspaper coverage of agriculture and the impact of various reporter, editor, and newspaper characteristics on source choice have garnered significant attention from researchers.

However, despite the attention given source choice and its implications for and reification of prominent communication theories, an exhaustive search of the relevant literature in journalism, agriculture, and agricultural communications found no studies addressing reporters' work-role identities with regard to their coverage of agricultural news or the part played by reporters' education in their source-choice decisions.

Objectives

This study examined source choices for coverage of the December 2003 bovine spongiform encephalopathy (BSE or mad cow disease) event to discover the sources reporters use when covering breaking agricultural news and the impact of reporters' work role identities, as reflected in beat assignments, on coverage of such issues.

Coverage of the December 2003 BSE event in the United States was selected for examination because this event was novel, timely, newsworthy, and significant to the public and required reporters to explain complex, science-intensive information. This study sought answers as to whether reporters' beat assignments affected the length of their stories about the event and the number and variety of sources used in such stories and to generate data in support of the following hypotheses:

Hypothesis 1: The mean length in words of stories written about the December 2003 BSE event by science specialty-best reporters will differ from the mean length of such stories written by reporters with other beat assignments.

Hypothesis 2: The mean number of sources in stories written about the December 2003 BSE event by science specialty-best reporters will differ from the mean number of sources used in stories written by reporters with other beat assignments.

Hypothesis 3: The mean variety of types of sources used in stories written about the December 2003 BSE event by science-specialty-beat reporters will differ the mean variety of types of sources used in stories written by reporters with other beat assignments.

Data supporting these hypotheses was in turn used to (1) suggest directions for further research into how reporters' work role identities might impact their ability to cover science-intensive crises news as reflected by their source choices for such coverage and (2) suggest implications for the work of agricultural public information officers and media relations professionals as they seek to "pitch" expert sources and their research results to inform news media stories about agricultural crises.

Methods

Study design, population of interest, and sample

To evaluate the study's hypotheses about coverage and source use in U.S. newspaper stories about the December 2003 BSE event, a content analysis of stories in selected major U.S. newspapers was conducted (Macnamara, 2003; Stemler, 2001; Dyer, 1996). Results of content analyses have been used to guide planning for crisis communication (Dyer, Miller, & Boone, 1991), although numerous researchers caution that their results cannot reliably be used to analyze complex newsroom issues or to address issues of audience impact, thus limiting framing constructs based on such analyses (Bartlett, Sterne, & Egger, 2005; Heinrichs & Peters, 2004; Lavie and Lehman-Wilzig, 2005).

The newspapers included in the population of interest were those represented in a census of stories on BSE from Lexis-Nexis for the eleven-month period from December 23, 2003 (when the first BSE event occurred) through October 31, 2004 (the end of the month before occurrence of the second U.S. BSE event). A search of the Lexis-Nexis database was conducted on August 22, 2005 (search terms "General News," "Major Papers," "mad cow" AND "production" AND "agriculture") yielded 296 stories, 190 of them from U.S. newspapers. To minimize potential differences in newsroom organization, policies, and practices and in national politics and culture, only newspapers from the United States were included in this study's analysis.

Content analysis was applied to compare a census of all stories in the population written by science-specialty beat reporters (31) with an equal-sized random sample of stories written by non-science-specialty-beat reporters. Reporter work-role identity was established by byline credit or by referencing the reporter in Bacon's Newspaper Directory, 2004 edition.

Data coding and analysis

Each story was reviewed and coded by two trained coders, according to a codebook based initially on the variables of interest and refined through four iterations of coder training. Initial coder training was conducted using content analysis of 10 randomly selected stories from the dataset; these stories were eliminated from the dataset before selection of the stories which form the basis of this study (except for any stories written by science-specialty-beat reporters, which were kept in the census of such stories and recoded for later analysis). During coder training, additional coverage themes were identified for use in analysis of the dataset, and coders were instructed in accurate recognition of all themes/content-analysis categories (Holsti 1969; Riffe, Lacy, & Fico, 1998). Coding variations were identified and addressed, and all differences were resolved. Intercoder reliability at the $p < .01$ level was achieved, as indicated by intercoder correlation coefficients for each pair of variables (Field, 2000).

Certain variables were unambiguous. For example, each story was labeled on its face according to its length (interval level data) and its newspaper of origin (nominal). Whether or not the writer of each story was a science-specialty-beat reporter (nominal) could be ascertained either by a byline containing the reporter's work-role identity (job title) as printed on the story or by consulting Bacon's Newspaper Directory (2004). The number of sources (interval) included in each story was determined by counting each unique source only once.

Fifteen dichotomous nominal variables (present vs. not present) were established for classifying sources into types, based on extrapolation from the literature (Albaek, Christiansen, & Togeby, 2003; Armstrong, 2004; Ericson, Baranek, & Chan, 1993; Ramsey, 1999; Salwen, 1995; Stempel & Culbertson, 1984; Sumpter & Braddock, 2002; Whitney, Fritzler, Jones, Mazzarella, & Rakow,

1989; Zoch & Turk, 1998). These categories comprised government representatives, government scientists, business representatives, business scientists, agricultural producers (farmers and ranchers), university representatives, university agricultural scientists, all other university scientists, Extension representatives, Extension scientists, trade association representatives, consumer group representatives, media, consumers (general public), and undefined. Each named individual used as a source was placed into the appropriate category based on his or her institutional/organizational affiliation as identified in the story being coded. For example, Secretary of Agriculture Ann Venneman was placed in the government representative category, while the named owner of a meat market was placed in the business representative category. The decision was made to classify veterinarians as scientists rather than merely as representatives of their particular employing organizations.

An “undefined” category was included because many sources were unnamed (Beall & Hayes, 1992). This category was applied to all organizations for which no individual representative was named and to all generic sources, such as “industry experts,” “consumers,” and similarly cited sources. Such a category varies from those used by some other studies, which entirely excluded “collective anonymous sources like ‘voters’ or ‘government officials’” (Sumpter & Braddock, 2002, p. 543). An exception was made for media outlets for which no individual representative was named; all citations of media outlets were coded as “media” rather than as “undefined” because it was deemed desirable to track all sourcing of other newspapers, books, Web sites, etc.

Three additional interval variables were calculated from those which had been coded. All scientist categories (business scientists, university scientists, university agricultural scientists, Extension scientists) were summed to yield the variable “total scientists,” and all agricultural scientist variables (university agricultural scientists, Extension scientists) were summed to yield the variable “total agricultural scientists.” Finally, all 15 original source categories were summed to yield the variable “source variety.”

All coded data were analyzed to determine statistically significant relationships. At the simplest level, means of the same variable from each of the two reporter groups (science-specialty-beat vs. non-science-specialty-beat) were compared to determine existence of any statistically significant differences (Field, 2001). Both reporter groups were analyzed simultaneously using bivariate correlation (Spearman’s rho) and one-way ANOVA.

The data analyzed for this article represent part of a larger study conducted for completion of the first author’s doctoral work.

Findings

Overall and role-specific means

Sixty-two stories were studied, 31 written by science-specialty-beat reporters and 31 written by reporters who were not science-specialty-beat reporters. Overall, regardless of reporter work-role identity, the following descriptive statistics were compiled for stories: story length, 220 to 2,749 words (mean=1,086.25); number of sources per story, 1 to 18 (mean=8.20 per story); distinct source types used per story, 1 to 9 (mean source-variety score=4.59); number of scientist sources used per story, 0 to 5 (mean=1.07) and number of agricultural scientists used per story, 0 to 4 (mean=.77).

Stories written by non-science-specialty-beat reporters averaged 1,021.48 words; those written by science-specialty-beat reporters, 1,172.36 words. Non-science-specialty-beat reporters used a mean 8.23 sources; science-specialty-beat reporters used a mean 8.36. Non-science-specialty-beat reporters used a mean 4.52 types of sources in each story; science-specialty-beat reporters used 4.81.

Non-science-specialty-beat reporters used a mean .81 scientist sources and .55 agricultural scientist sources; science-specialty-beat reporters used a mean 1.36 scientists and 1.00 agricultural scientists.

Statistically significant correlations

The number of sources used in stories was positively correlated with both story length and source variety ($p < .05$), each of which was correlated with the other — that is, the longer the story, the more sources used and the greater the variety of sources used; the more sources, the greater the source variety, as shown in Table 1.

Similarly, the total number of scientists cited as sources and the number of agricultural scientists used are correlated ($p < .05$), and each is correlated with both source variety and story length ($p < .05$). Again, the correlation of these two categories of scientist sources is not surprising, since agricultural scientists contribute to total scientist numbers, and both contribute to source variety (Ott & Longnecker, 2001), as shown in Table 1.

Table 1

Intercorrelations Between Number of Sources, Story Length, Source Variety, Number of Scientist Sources and Number of Agricultural Scientist Sources

	No. Sources	Story Length	Source Variety	No. Scientists	No. Ag Scientists
No. Sources	-	.653*	.640*	.090	.076
Story Length	-	-	.644*	.302*	.279*
Source Variety	-	-	-	.461*	.386*
No. Scientists	-	-	-	-	.849*
No. Ag Scientists	-	-	-	-	-

Note. Spearman rho used as test statistic. * $p < .05$

Work-role identity summary statistics

Only two of the science-specialty-beat reporters in the population were identified simply as “science writer.” Thirteen different areas of expertise were designated for the 20 other science-specialty-beat reporters producing the stories studied, including agribusiness, biotechnology, environment, medicine, or health. Most non-science-specialty-beat reporters were known either as staff reporters (6) or staff writers (9) or had no title (12). Bacon’s was used to verify that these untitled reporters were not science-specialty-beat reporters. Three reporters were designated as business reporters, and one, as a business writer.

Only two non-science-specialty-beat reporters produced more than one story about BSE (Jonathan Martin, Seattle Times, two stories, and Sue Kirchhoff, USA Today, two stories), but seven science-specialty-beat reporters wrote or co-wrote multiple stories: Sandra Blakeslee, Pittsburgh Post-Gazette, 2; Chris Clayton, Omaha World Herald, 2; Mark Kavar, Omaha World Herald, 4; Michelle Cole, Oregonian, 2; Andy Dworkin, Oregonian, 7; Richard Hill, Oregonian, 3; and Joe Rojas-Burke, Oregonian, 2. Almost one-half of the BSE stories written by science-specialty-beat reporters (14/31) were published in just one newspaper, the Portland Oregonian.

Science specialty-beat ropers great use of scientist/agricultural scientist sources

Analysis of data from this sample showed that stories written by science-specialty-beat reporters did not differ significantly in length, number of sources, or source variety from stories written by non-science-specialty-beat reporters, although one-way ANOVA was significant at the $p < .05$ level for differences in numbers of agricultural scientists used as sources. Science-specialty-beat reporters used more scientists and agricultural scientists as sources than did other types of reporters.

Table 2

One-Way ANOVA for Differences in Story Characteristics Based on Reporter Work-Role

Source of variation		Df	F	P
Story length	Between groups	1	1.306	.258
	Within groups	60		
Number of Sources	Between groups	1	.015	.903
	Within groups	60		
Source variety	Between groups	1	.488	.487
	Within groups	60		
Number of scientist sources	Between groups	1	3.413	.070
	Within groups	60		
Number of ag scientist sources	Between groups	1	3.978	.051*
	Within groups	60		

* $p < .05$

As shown in Table 3, reporter work-role identity was found to be correlated with use of certain types of sources, specifically with both the numbers of scientists and the numbers of agricultural scientists used as sources in each story ($p < .05$), that is, designation as a science-specialty-beat reporter was associated with using more scientists and agricultural scientists as sources than was designation as a non-specialty reporter.

Table 3

Correlations Among Reporter Work-Role Identity and Story Characteristics

	Story Length	Number of Sources	Source Variety	No. Scientist	No. Ag Scientists
Work-Role ID	.118	.046	.062	.290*	.272*

Note: Spearman rho used as test statistic. * $p < .05$

Source choice patterns

Although none of the differences in individual source-type relationships proved statistically significant, regardless of reporter work-role identity patterns of source choice emerged, with the largest number of named sources being selected from among industry representatives (140). Government (46) and educational (46) sources were used in equal numbers, while consumers (44) were a close second to these two groups. Reporters of both types chose a total of 27 media sources. Undefined (unnamed) sources were included in the 62 stories 175 times. These results are summarized in Table 4.

Table 4

Actual Number of Named Sources in Each Category, Grouped by Work-Role Identity of Reporter

Source Category	No. of Unique Citations in Stories Written by Science Specialty-Beat Reporters	No. of Unique Citations in Stories Written by All Other Reporters
Government representatives	4	12
Government scientists	12	18
Total government sources		46
Business representatives	50	19
Business scientists	2	1
Agricultural producers	12	8
Trade association reps	24	24
Total industry sources		140
University representatives	4	0
University agricultural scientists	7	13
University scientists (not ag)	7	8
Extension representatives	3	1
Extension scientists	1	1
Total university sources		46
Consumer association reps	14	17
Consumers	8	5
Total consumer sources		44
Media	16	11
Total media sources		27
Undefined	83	92
Total undefined sources		175

Conclusions, Implications and Recommendations

Discussion of results

Few differences found between science-specialty-beat reporters and other reporters. Analysis of data in this sample showed that reporters designated as science-specialty-beat reporters did not (a) write longer stories, (b) use more sources, or (c) use a greater variety of sources than did reporters having other work-role identities. Although these particular issues regarding “science writers” have not been thoroughly explored in the literature, based on long-standing journalistic practice, it stands to reason that more “in-depth” stories might be longer, might contain more sources, and that the more sources used, the greater the chance for including more different kinds of sources in the mix (MacDougall, 1987). However, that was not shown to be the case here. The fact that stories written by science-specialty-beat reporters, including agricultural reporters, were no different from those written by other types of reporters might be extrapolated to mean that, at least based on this sample, specialty-reporter coverage of agriculturally relevant events may not prove to be more comprehensive nor of greater interest and utility to readers.

The nulls of the three hypotheses posited in this study cannot be rejected. Comparison of means using one-way ANOVA between stories written by science-specialty-beat reporters and those written by other types of reporters showed no statistically significant differences with regard to mean story length, mean number of sources used, and mean overall variety of sources used, although a statistically significant difference ($p < .05$) was found between the two groups in the mean number of agricultural scientists used as sources.

Use of expert sources. It has long been recognized that the media play an important role in disseminating science information to the public (Borchelt, 2008; Holland, 2009; Nisbet & Scheufele, 2009; Peters et al., 2008; Wilson, Code, Dornan, Ahmad, Hebert, & Graham, 2004), much of which is associated in newspaper stories with risks (Ruth, Eubanks & Telg, 2005; Ten Eyck, 2000). Previous research has called upon the media to provide more in-depth information for the public, especially about topics involving science, through encouraging reporters to attain increased levels of scientific literacy in order to provide more such in-depth coverage (King, Cartmell, & Sitton, 2006). Researchers recommend accessing experts as sources of science information as one way to counteract reporters' lack of expertise about such matters (Heinrichs & Peters, 2004; Ramsey, 1999; Whaley & Tucker, 2004), but increased scientific and agricultural literacy on the part of reporters is almost surely needed to choose expert sources wisely (Vestal & Briers, 1999; Whitaker & Dyer, 2000; Wingenbach, Rutherford, & Dunsford, 2003).

Source choice is a job function common to all reporters. Reporters try to choose the best sources for a given story based on the source's institutional position, knowledge, accessibility, or cooperativeness, or some combination of these characteristics. However, previous research has documented that a source's political power or social influence often unduly influences such choices, causing government officials and corporate spokespersons to be overrepresented in the source pool (Whitney, Fritzler, Jones, Mazzearella, & Rakow, 1989). For example, Ashlock, Cartmell and Kelemen (2006) reported that 34.88 percent of the sources for information about BSE cited by stories in their sample were government officials and 23 percent were industry representatives, but only 4.49 percent were university scientists. Surprisingly, sources representing business, agricultural producers, and trade associations (industry, 140) overwhelmingly dominated the stories in our sample; the governmental (46), educational (46), and consumer (44) sources found to predominate in other studies were in a decided minority here, a result that doubtless deserves further scrutiny. Such factors in source-choice also may reflect media agenda-setting or framing effects (Ashlock, Cartmell & Kelemen, 2006; Irlbeck, 2009; Lee, 2004; Kitzinger & Reilly, 1997; Salwen, 1995), considerations outside the framework of this study.

Impact of reporters' institutional work roles. This study did address the impact of reporters' institutional work roles on source choice, which other researchers have found to be more important than reporters' personal characteristics in making such selections. This study's findings did not support the idea that work-roles influence the ways in which reporters fulfill their job duties, including their choice of information sources (Clark & Illman, 2003; Craft & Wanta, 2004; Dunwoody, 1978, 1979; 1980; Holland, 2009; Kitzinger & Reilly, 1997; Logan, 2001; Shoemaker, Eichholz, Kim, & Wrigley, 2001), although such impact may be derived from sources' influence on reporters' agendas and frames. According to the research cited, source choices of science-specialty-beat reporters (reporters specializing in coverage of stories with significant science components) may reflect not just normal newsroom routines and practices or individual reporter characteristics, but may be influenced by such reporters' special position within the news organization, by their special training, and by the narrative and expositional demands of the subject matter covered. However, this study found no evidence to support such a conclusion.

By extension, work by Shoemaker, Eichholz, Kim, and Wrigley (2001) and by Craft and Wanta (2004) suggests that (a) a newspaper's employing a science-specialty-beat reporter may go a long way toward determining the nature of its coverage of science-based news and (b) the unique position of a science-specialty-beat reporter in a newsroom could impact the quantity, type, and tone of science

work-role, perhaps reflecting that newspaper beat assignments may be made arbitrarily, with little regard to reporter education or expertise, detracting from any positional uniqueness as posited by these researchers.

Special reporter–source relationships. Science stories about complex issues often demand sources beyond the usual institutional spokespersons, requiring explanation by experts in science and technology. Science-specialty-beat reporters often use the same expert sources continually, laying a foundation for the development of special reporter–source relationships. Previous research has noted reporters’ focus on educational and governmental sources, which may in fact control reporter access to meet their own agendas (Ashlock, Cartmell & Kelemen, 2006; Ericson, Baranek, & Chan, 1993; Miller, 1999); such focus was not supported by the results of this study. In fact, regardless of work-role identity, reporters in this study chose industry sources by a greater than 3-to-1 margin over other source types.

Gandy (1982) has noted a special affinity between science-specialty-beat reporters and their sources, evidenced by such writers’ repeated use of the same sources, which can be compared to the practices of police-beat reporters as documented by Chermak (1995). Gandy cautions that such close relationships and repeated contacts may result in sources using reporters for agenda-setting or framing purposes of their own. Examination of the lists of sources used by science-specialty-beat reporters in this sample supports Gandy’s contentions that science-specialty-beat reporters often use the same source types (albeit, here, industry sources), but his conclusions about the impact of these practices on agenda-setting and framing fall outside the scope of this study.

Current study limitations and recommendations for further research

This study focused on the dichotomy in source choice between reporters with one organizational role — that of science-specialty-beat reporter — and those with any other work-role identity. Although science-specialty-beat reporters were not found to use different types of sources than other reporters, they did use more scientists and agricultural scientists as sources. The nature of this relationship over time was not explored; for example, particular reporters were not followed over the eleven-month lifespan of the sampled event to discover whether their patterns of source use remained constant or changed due to story maturation or to source winnowing (Sumpter & Braddock, 2002). Such investigation could be fruitful. Additionally, the extensive use of “undefined” sources, for example, experts, advocates, critics, for which no representative was named, has not been explored in the literature, although some research exists dealing with sources termed part of the general public (Sumpter & Braddock, 2002). The impact of sourcing of unnamed individuals upon public understanding of complex stories and upon media credibility should be explored.

Only source identity was tracked across the sampled stories. Further investigation might focus on the dominance and prominence (Stempel & Culbertson, 1984) of each source in the sampled stories, determining whether these characteristics varied with reporter work-role identity. Additionally, the reliance of reporters on industry sources in covering the first U.S. BSE event is surprising and should be investigated further.

Frames employed in coverage of BSE in the United States should be compared with Ruth and Eubanks’ (2005) findings that four frames were used in coverage of such outbreaks in Canada, identified as industry crisis, economic calamity, blame/responsibility, and health risk and to findings by Irlbeck (2009) and Ashlock, Cartmell and Kelemen (2006). The relationship of such frames with sources used should be explored, as well as frame shifting that may occur as a story matures (Chyi & McCombs, 2004).

This study examined source choice but did not investigate the role of information subsidies in initial source identification and selection. Previous research has indicated that subsidies such as news releases and press conferences may play an important part in source choice and in agenda-setting and framing (Borchelt, 2008; Day, 2003; Dunwoody, 1980; Dunwoody, Brossard, & Dudo, 2009; Kelley, 2000; Melgares, Rutherford, & Alexander, 2003; Nisbet, Brossard, & Krepsch, 2003; Nisbet & Scheufele, 2009; Rost, Savonen, & Duncan, 1993; Skillman & Miller, 2003; Thompson, Able, & Maretzki, 2001); thus the role of such subsidies in coverage of BSE events should be investigated.

This study examined only reporters' work-role identity and ignored reporters' personal and educational characteristics (Grantham & Irani, 2004); given that previous research has emphasized the possible role of such characteristics in reporters' agenda-setting, framing, and source choice decisions, reporter characteristics should be examined in future studies, in conjunction with work-role identity. Such investigation seems particularly important given the fact that science-specialty-beat reporters may exhibit personal and educational characteristics different from those of other reporters.

Finally, population parameters for this study dictated the comparison of a census of science-specialty-beat reporters (time and place sample) (Glass, Peckham, & Sanders, 1972; Hinkle, Wiersma, & Jurs, 1979; Oliver & Hinkle, 1982) with a random sample of other types of reporters. Thus, this study violated several methodological guidelines for performing a content analysis. In the strictest sense, the results presented here are not generalizable to longer time periods or to larger groups of reporters. They generally do, however, match what we would anticipate the outcome to be in an environment where specialty reporters influence one another (Dunwoody, 1979, 1980; Dunwoody & Shields, 1984; Shoemaker & Reese, 1991; Weigold, 2001) and where institutional-level decisions are affected by agenda-setting, framing, and the news wave. Future research could benefit from sampling populations including larger numbers and wider varieties of newspapers, as well as other types of media, and including media with large enough numbers of science-specialty-beat reporters to allow randomization.

Contributions to the field

Although the research consensus is that factors such as the news wave, reporter/editor individual characteristics, newsroom organization, newsworker routines, and use of information subsidies may impact reporters' source choices, few guideposts exist by which to gauge the relative importance of the influence of these different factors on selection of sources. Further, most source-choice research has focused on coverage of political or crime news or on reporter/editor gender, ethnicity, or work routines. Few published studies were found applying agenda-setting or framing theory to explanations of source-choice in coverage of agricultural breaking news or showing how reporter, editor, newsroom, or newspaper characteristics impact such coverage. Thus, the current study sought to illuminate to what extent reporters' designation as science-specialty-beat reporters influenced their use of experts in their coverage of the December 2003 BSE event in the United States.

This study is of course limited by its sample, newspapers included in the LexisNexis database, and by its design, focused only on source-choice relative to reporter work-role identity. However, its contribution to the literature of the field transcends these limitations in that it questions previous studies' findings concerning coverage of science-intensive stories. The fact that in this study no differences in coverage were found between science-specialty-beat reporters and other types of reporters should provoke trenchant questions from both scholars and journalists. Such questions might include whether science-specialty-beat reporters indeed can provide more comprehensive and

informative coverage of science-intensive stories and, if not, whether their failure lies in low-levels of science literacy (King, Cartmell & Sitton, 2006) rooted in inadequate training (Vestal & Briers, 1999; Whitaker & Dyer, 2000; Wingenbach, Rutherford, & Dunsford, 2003) or in newsroom institutions that do not accommodate the exercise of their talents and skills (Chermak, 1995; Dunwoody, 1980; Gandy, 1982). In addition, relationships explored in the current study may be extrapolated and tested with regard to breaking news coverage of other agricultural crises, for example, Avian flu outbreaks or the 2008 salmonella outbreaks in the U.S.

Implications for the National Research Agenda in Agricultural Communications and for agricultural public information officers and media relations practitioners

This study addresses priorities stated in RPA2 - the desire of agricultural communicators to “aid the public in effectively participating in decisions making related to agriculture,” through providing information on which such decisions can be based (National Research Agenda, 2007-2010, p. 4).

In particular, implications of this study and the support it does or does not offer previous research may help agricultural public information officers (PIOs) and media relations practitioners in their efforts to “disseminate . . . relevant information that facilitates public decision making about high priority agricultural issues” and to “improve the effectiveness of mass media coverage of agricultural issues” (National Research Agenda, 2007-2010, p. 4). Improving such professionals’ understanding of the ways in which reporters’ work-role identities may influence coverage could help them more effectively craft their information subsidies and determine better how to target their subsidies and pitch them to particular reporters. For example, if science-specialty-beat reporters are more likely to use scientists or agricultural scientists as sources with regard to agricultural crisis news, agricultural communicators should target these reporters with their information.

Concentrating on the reporters most likely to provide coverage will facilitate effective use of time and other resources by practitioners and improve their chances for placement of important agricultural information. In this instance (2003 BSE event), the knowledge that proximity and urban-location influence coverage might have determined on which newspapers agricultural media relations practitioners would concentrate their attention. It is to be hoped that studies such as this one will contribute to enhancing the effectiveness of practitioners through increasing their ability to identify and target receptive journalists.

Overall, the authors believe that the reach and impact of this study could be increased by its replication for other similar populations and other types of crisis events, allowing the application of a grounded theory approach to the additional data to develop stronger conclusions and more effective applications for agricultural PIOs and media relations practitioners.

Keywords

mad cow, BSE, reporters, sources, science reports

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Before it Hits the Fan: Pre-Crisis Beef Producer Information Source Preferences

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Abstract

*The purpose of this statewide study was to determine preferences for the sources of information beef producers in Oklahoma use and trust when they seek information about agriculture during a crisis. Participants in this study were randomly selected from a population of 48,000 beef producers in the Oklahoma. All 470 respondents completed a telephone survey conducted by the Oklahoma Agricultural Statistics Service (OASS). Descriptive statistics, *t*-tests, and cross tabulations were used to analyze the data. Producers preferred their veterinarians when seeking information about animal health issues and any agriculturally related crisis; and preferred to receive information through county extension publications. They also perceived the local veterinarian as the most trusted and reliable source of information available. The Oklahoma State University Cooperative Extension Service, through the county extension agents and the local area livestock specialists, and the USDA were also trustworthy and reliable sources.*

Introduction and Conceptual Framework

Each day, the public is bombarded with pages upon pages of information from many different sources. With so many sources of information available, trustworthiness and reliability are paramount. Correct and helpful information is critical for both consumers and producers alike to facilitate their way through a typical day; but, what if there's a crisis involving the food and fiber system?

In the event of a terrorist attack against agriculture, the public will be forced to make life-sustaining decisions in regard to their health, safety and the food they provide to their families or produce for consumption. State agencies, special interest groups, manufacturers and the media will have the responsibility of disseminating information to both consumers and producers.

Penrose (2000) and Covello (2003) suggested there is a value in clearly identifying the key audience stakeholders, especially before a crisis occurs. Understanding and responding to the audience provides information sources the best opportunity to serve those groups when emergency is needed (Wray, Kreuter, Jacobsen, Clements, & Evans, 2004).

Riesenberg and Gor (1989) maintained the issue of the "communication gap" between the extension service personnel and the farmer has been the "stumbling block" of the "methods employed for the dissemination of agricultural information" (p.7). Past studies of farmers and other agriculturalists show the preference of the two types of sources of information dissemination, interpersonal and mass media, as identified by Riesenberg and Gor (1989); furthermore, farmers are reported to prefer the interpersonal style or method of receiving information when they have a choice between interpersonal and mass media.

Interpersonal

In a study of part-time and full-time beef farmers, Obahayujie and Hillison (1988) found part-time beef farmers preferred methods using personalized visits or on-farm demonstrations. Riesen-berg and Gor (1989) found agriculture producers preferring to receive information about new and innovative programs by interpersonal and interaction methods. Bruening (1991) reported Iowa farmers also preferred field demonstrations and county and local meetings as useful communication methods when learning about environmental issues. In a later study by Bruening, Radhakrismma, and Rollins (1992), the same preference was shown by Pennsylvania farmers for methods including demonstrations, tours, or on-farm consults when seeking to learn information about the environment. The least favored methods were those with minimal interaction, for example home study or computer assisted instruction.

In a study surveying extension agents about their perceptions of appropriate methods for outreach, Ohio Cooperative Extension Agents reported a high level of preference for the interactive interpersonal methods and low levels of preference for the mass media based methods (Bouare & Bowen, 1990). Historically, the extension service has been and remains a primary source of information for rural areas (Martin & Omer, 1988; Richardson and Mustian, 1994; Buford, Bedeian & Lindner, 1995).

Mass media

Okai (1986) identified extension publications and radio and TV as two of the top four preferred information sources by small-scale Missouri farmers; however, vocational agricultural instructors and area extension specialists were ranked the lowest. A later study by Padgitt (1987) found the opposite when results showed university extension specialists and the Cooperative Extension Service to be considered the most reliable sources, while methods employing radio and television were considered the least reliable.

In the second half of the full-time/part-time farmer study mentioned earlier, Obahayujie and Hillison (1988) maintained full-time farmers preferred mass media, such as newsletters publications, bulletins, radio programs, and leaflets/pamphlets, to the interpersonal type of communication. Richardson (1989) and Richardson, Clement, and Mustian (1997) maintained traditional extension audiences, such as beef producers, prefer newsletters, bulletins, personal visits, and field day or method demonstrations. Gamon, Bounaga and Miller (1992) and Carter and Batte (1994) agreed farmers show a preference for traditional delivery methods.

Nordstrom, Wilson, Kelsey, Maretzki and Pitts (2000) found focus groups to suggest and recommend mass media methods (TV, newspapers, and radio) as tools to disseminate agricultural education materials. Boone and Zenger (2001) also found homemaker focus to use mass media. The study also showed extension information as more accurate and reliable than mass media, but extension information was more difficult to obtain.

When looking at specific issues such as food safety, Whatley, Doerfert, Kistler, and Thompson (2005) reported there to be five primary sources of information: experiential, family, government agencies, professional associations, and media. Food safety information is about educating the consumer and Whatley, et al. (2005) suggested identifying consumer information source trust is the first step in any consumer education plan; however, Whatley, et al. (2005) suggested little information has been collected about food safety source trust.

In a previous study, Frewer and Miles (2003) did identify medical sources as being a highly trusted source when communicating about food risks, while the government sources and many envi-

ronmental pressure groups were trusted less; and the food industry was trusted the least.

Although Woodson (2005) maintained newspaper, radio, and television are sources all county extension agents use, Boldt (1987) suggested county extension agents use varying media sources to disseminate information to diverse audiences. Carter and Batte (1994) suggested their findings indicate print media are most likely to be well received by farmers seeking information through educational materials.

Identifying the sources of information beef producers use and trust prior to a crisis event could mean the difference between chaos and ordered preparedness. The problem addressed by this study is the lack of information showing where beef producers seek information and the sources of information trusted by those beef producers in the context of an agriculturally related crisis, such as an incident of agroterrorism.

The study also showed extension information as more accurate and reliable than mass media, but extension information was more difficult to obtain.

Purpose and Objectives

The purpose of this study was to identify the preferences for the sources of information Oklahoma beef producers' use and trust when seeking information about agriculture during a crisis. Specifically, this study addressed the following research questions:

1. What are the sources of information beef producers in Oklahoma use when seeking information about an agriculturally related crisis?
2. What are Oklahoma beef producers' levels of trust and reliability in the information sources used?
3. How did Oklahoma beef producers' perceptions toward information source trust and reliability differ based upon the demographics of age, farm size, education level, and access to a computer with Internet access?

Methods and Procedures

For this study, a beef producer was operationally defined as any individual owning at least one animal of any beef cattle breed. Descriptive research was chosen as the research method since the study dealt with perceptions of beef producers and their preferred sources of information used when seeking to learn more about animal health issues in the context of an agriculturally related crisis.

The target population of this study was all beef producers in Oklahoma. The population, according to the Oklahoma Agricultural Statistics Service (OASS), was approximately 48,000 beef producers. The list frame of beef producers in the state was updated each year through property assessment records. The number was fluid and approximated due to the fluctuation of citizens investing in the ownership of cattle or selling off their cattle and divesting in the beef industry. A random sample of 2,000 names from the target population was selected using a computerized random selection process. For this study, using the aforementioned survey population, Krejcie and Morgan (1970) suggest a minimum of 381 respondents for a 95 percent confidence level and a sampling error of +/- 5 percent.

The questionnaire was divided into two parts, each part coinciding with the two objectives of the study: information sources and source trust. Three categorical questions assessed the respondent's perceptions about sources of information they would choose first when given a choice and the medium in which they would like information presented to them (Ashlock, 2006).

Two additional questions obtained the respondent's level of reliability and trust in specific sources of information using Likert-type questions. The scales used for both questions were as follows: Reliable: 1 = Not Reliable, 2 = Slightly Reliable, 3 = Neutral, 4 = Reliable, 5 = Very Reliable; and Trust: 1 = Not Trustworthy, 2 = Slightly Trustworthy, 3 = Neutral, 4 = Trustworthy, 5 = Very Trustworthy. The remainder of the survey instrument was used to collect demographic information about the beef producers. Questions in this area were closed-ended or partially closed-ended.

To minimize measurement error, the construction of the questionnaire was completed under the guidance of a panel of experts in both the academic and beef cattle production fields for instrument validation. Data were collected by the OASS using in-house computer-aided telephone interviewing procedures. Data collection error was controlled by conducting a formal interviewer training session to familiarize the interviewers with the instrument. The OASS used seasoned interviewers to ensure ease of use with the computer system. A comparison of early and late responders was examined to control for nonresponse error based on guidelines set forth by Lindner, Murphy, and Briers (2001). No significant difference between early and late responders was shown to exist. The instrument was found to be reliable with a Cronbach's alpha of .84. Data were analyzed and interpreted using frequencies, percentages, means, modes, standard deviations, and cross tabulations.

Findings

The data was collection over a period of twelve, non-consecutive days. A random sample ($n = 2,000$) was drawn from the overall target population of beef producers in Oklahoma ($N = 48,000$). Of the sample population, 678 completed calls were made providing the researcher with 470 usable responses.

Findings Related to Demographics of Beef Producers in Oklahoma

The typical beef producer from Oklahoma was male (69.72%) and had at least some high school education (59.80%). The average age of the typical beef producer was 59.5, with a range from 24 to 90 years of age; and the producer owns a computer with access to the Internet (62.3%).

Beef producers are primarily employed within the beef industry (57.90%) owning a cow – calf operation (87.45%), with one to 49 head of cattle (35.12%). Other operation sizes included 31.06% of respondents owning from 100 to 499 head, 23.83% of respondents owning 50 to 99 head, 5.96% owning 500 to 999 head, and 2.13% owning 1,000 or more head of cattle.

Findings Related to Preferred Information Sources

During the survey, respondents were asked three questions regarding preferred information sources. Two questions gave the respondents a choice of “Yes” or “No” to a list of information sources and an opportunity to give an open-ended response for additional sources. When asked “When you seek information about animal health issues, where do you first look,” respondents indicated “Veterinarian” 34.9% of the time; “Other” and “Internet” were 12.55% and 11.70%, respectively. Responses to the “Other” category provided additional sources as being “County Extension Agent,” “Oklahoma State University,” “Law Enforcement,” “Family,” and the “Oklahoma Cattleman's Association.” The remaining 40.86% of responses were divided between “Magazines” – 10.70%, “USDA” – 9.36%, “Television” – 9.15%, “Newspaper” – 6.59%, “Radio” – 2.98%, and “Word of Mouth” – 2.76%.

The second question asked, “When you seek information about an agriculturally related crisis, where do you first look.” Respondents indicated “Veterinarian” 26.81% of the time; “Television” 14.25% of the time; and the “Internet” 13.62% of the time.

The remaining 45.32% of responses were divided between “Other” – 12.98%, “USDA” – 11.70%, “Newspaper” – 10.00%, “Magazines” – 3.62%, “Radio” – 3.19%, “Word of Mouth” – 2.55%, and the “State USDA” – 1.28%. Responses to the “Other” category provided additional sources as being “County Extension Agent,” “State University,” “Local Agricultural Department,” “Law Enforcement,” “Government Agencies,” “Family,” “Oklahoma State University Veterinarian Services,” “Noble Foundation,” “Oklahoma Cattleman’s Association,” and the “High Plains Journal.”

The final question asked respondents to identify preferred methods for receiving information. When asked, “What would be your number one preference to receive information about an agriculturally related crisis,” 49.36% of the respondents identified through a “County Extension Publication”. Of the remaining 50.64%, “Other” methods were identified 15.11% of the time, “Local Meetings” were identified 10.21% of the time, “Mail” was identified 6.59% of the time; “Newspapers” were identified 6.38% of the time; “Don’t Know” was a choice 4.25% of the time, “E-mail” was identified 3.62% of the time, and the “Internet” was chosen 2.76% of the time. Responses to the “Other” category provided additional sources as being “Television,” “Friends,” “Radio,” “Sale Barns,” “Oklahoma State University,” and the “Noble Foundation.”

Findings Related to Level of Trust in Preferred Information Sources

Research question two sought to determine the Oklahoma beef producers’ perceived level of trust and reliability of multiple information sources. Two questions were designed to answer this research question.

The first question asked respondents to rate their level of reliability regarding multiple information sources using a five-point Likert-type scale (1 = Not Reliable, 2 = Slightly Reliable, 3 = Neutral, 4 = Reliable, 5 = Very Reliable). When asked “What sources do you believe to be the most reliable,” 56.8% of respondents reported the “Local Veterinarian” as very reliable; “Area Livestock Specialist (45.4%),” “County Extension Agent (50.0%),” “Local Daily Newspaper (36.2%),” “Local Weekly Newspaper (31.3%),” “USDA (44.5%),” and “ODAFF (41.5%)” as reliable; “AgriNet (43.4%),” “Breed Association (43.4%),” “Cowman Magazine (54.5%),” “High Plains Journal (56.6%),” and the “Internet (49.1%)” as neutral (Table1).

Table 1
Beef Producers’ Information Source Reliability

Information Source	<u>M</u>	SD
AgriNet	3.33	.923
Area Livestock Spec.	3.53	.899
Breed Association	3.35	.899
County Extension Agent	3.85	1.010
Cattlemen’s Magazine	3.19	.887
High Plains Journal	3.21	.906
Internet	2.82	1.049
Local Daily newspaper	2.85	1.152
Local Weekly newspaper	2.80	1.104
Local Veterinarian	4.36	.937
USDA	3.89	1.032
Okla. Dept. of Ag, Food & Forestry	3.64	1.007

Note: Classification based on the scale: M = 4.20 or higher = Very Reliable; 3.40 – 4.19 = Reliable; 2.60 – 3.39 = Neutral; 1.80 – 2.59 = Slightly Reliable; and 1 – 1.79 = Not Reliable

The second question asked respondents to rate their level of trust regarding multiple information sources using a five-point Likert-type scale (1 = Not Trustworthy, 2 = Slightly Trustworthy, 3 = Neutral, 4 = Trustworthy, 5 = Very Trustworthy). When asked “What is your level of trust in the following sources of information,” 54.7% of respondents reported the “Local Veterinarian” as very reliable; “AgriNet (35.7%),” “Area Livestock Specialist (46.4%),” “County Extension Agent (50.4%),” “Local Daily Newspaper (35.3%),” “USDA (49.8%),” and “State’s USDA (43.8%)” as reliable; “Breed Association (40.9%),” “Cowman Magazine (53.8%),” “High Plains Journal (54.5%),” and the “Internet (48.3%)” as neutral (Table 2).

Table 2
Beef Producers’ Information Source Trust

Information Source	<u>M</u>	SD
AgriNet	3.47	.934
Area Livestock Spec.	3.53	.904
Breed Association	3.34	.898
County Extension Agent	3.89	.969
Cattlemen’s Magazine	3.25	.832
High Plains Journal	3.29	.847
Internet	2.79	1.018
Local Daily newspaper	2.78	1.189
Local Weekly newspaper	2.77	1.134
Local Veterinarian	4.45	.765
USDA	3.87	1.003
Okla. Dept. of Ag, Food & Forestry	3.69	.904

Note: Classification based on the scale: M = 4.20 or higher = Very Trustworthy; 3.40 – 4.19 = Trustworthy; 2.60 – 3.39 = Neutral; 1.80 – 2.59 = Slightly Trustworthy; and 1 – 1.79 = Not Trustworthy

The data were cross-tabulated by examining the level of trust in the multiple information sources in comparison to age, farm size, education level, and computer/Internet usage. The data reinforced the veterinarian as the trusted information source and age had no effect on perceptions of trust in the veterinarian.

The findings also revealed age as having no effect on perceptions of trust toward the Internet or local/weekly newspapers, as all age groups reported lower trust scores for these three information sources. When analyzing the same question as compared to farm size and its affect on perceptions relating to each beef producers’ trust in information sources, the trend remained the same as reported above with the local veterinarian as the most trusted source. The findings also showed the same decreasing trend in trust toward the Internet and local/weekly newspapers.

When assessing the beef producers’ level of trust in information sources by education level, beef producers’ trust level appeared to increase as the amount of education level increased. This increasing trend is prevalent if the two groups with only one respondent, education specialist and professional, are removed. Although the Internet and local daily/weekly newspaper were continuing to be categorically low, all areas of trust showed slight increasing trends of trust as educational level increased. When assessing the beef producers’ level of trust in information sources by computer usage with Internet access, data revealed a higher amount of trust with the beef producers who owned an Internet accessible computer.

Although the Internet and local daily/weekly newspapers were categorically low, all areas of trust showed an increased level of trust regarding each information source with the exception of the local daily and weekly newspapers and the local veterinarian. In each of these three categories, the trust level means were virtually equal. Data revealed the veterinarian was a highly trusted source regardless of computer usage/Internet access and the local daily and weekly newspapers were regarded less trustworthy regardless of computer usage/Internet access.

Conclusions-Implications-Recommendations

Conclusions related to Beef Producers' Preferred Sources of Information

The typical beef producer from Oklahoma looks first to his or her veterinarian when seeking information about animal health issues and any agriculturally related crisis. Secondly, producers turn to the Internet and television. In addition, beef producers prefer to receive information through county extension publications. These findings support previous research showing value of extension publications, Internet, and television as preferred information sources (Okai, 1986; and Taylor & Perry, 2005); especially the television in the event of bioterrorism, and the influence of the Internet on crisis communication (Pollard, 2003). College graduates and older audiences preferred print publications; as compared to audiences under 30 who preferred radio and television forms of media (Reina, 1995).

Based upon the findings above, it was concluded the veterinarian services profession should be prepared to provide the Oklahoma beef producers any type or form of information regarding preparatory actions for or protection from terrorist activities.

It was also concluded the OSU Cooperative Extension Service's print publications are considered a primary method of disseminating information for the state's beef producers regarding agroterrorism or beef industry crisis issues.

Conclusions Related to Level of Trust in Preferred Information Sources

The typical beef producer from Oklahoma views the local veterinarian as the most trusted and reliable source of information. The county extension agent, USDA, and local area livestock specialists are also trustworthy and reliable sources. While findings from Okai (1986) show a lack of preference for area extension specialists, this study revealed beef producers in Oklahoma as having a high level of trust for the area livestock specialists, supporting previous research by Padgett (1987).

When comparing the cross-tabulated mean scores of the demographic variables of age and farm sizes, no trend was shown to influence beef producer's perceptions of trust in the varied information sources. However, when comparing the means by education level, the level of trust increased as the beef producers' education level increased. The same trend was found when comparing computer usage and Internet access; beef producers reported higher levels of trust if they owned a computer with Internet access.

It is important to note only in the instance of the Internet and local daily or weekly newspapers did the variables of age, farm size, education level, or computer usage/Internet access have no effect on trust. In all cases, the level of trust in these three sources of information remained lower than any other source. While previous studies show the Internet (Newport & Saad, 1998), and local daily or weekly newspapers (Reina, 1995; and Denton, 1996) as trustworthy sources, this study supports research by Newport and Saad (1998) showing local newspapers having low credibility.

Rogers (2003) defines opinion leadership as “the degree to which an individual is able to influence other individuals’ attitudes or overt behavior in a desired way with relative frequency” (p. 27). Based upon the findings above, it can be concluded veterinarians, county extension agents, the USDA, or local area livestock specialists can be influential in shaping the opinions of this state’s beef producers.

It can also be concluded veterinarians, county extension agents, the USDA, or local area livestock specialists should have the requisite knowledge of preparedness levels, crisis planning, and agroterrorism protection to provide or disseminate information regarding agroterrorism or crisis communications. This conclusion supports the findings of Fink (1986); Henry (2000); and Seeger, Sellnow, and Ulmer (2003) who found for crisis management to be effective there is a need for a strong foundation of effective planning and communication before an incident.

Implications for Preferred Information Sources

The beef producers in Oklahoma report to seek information regarding any animal health issue or agriculturally related crisis through their veterinarian first and then turn to the Internet or television as secondary sources. Beef producers also reported preferring information to be disseminated through county extension publications as a first choice.

This study was not designed to assess agroterrorism and crisis literacy or knowledge levels of those organizations of individuals providing information to the public; the findings above highlight important implications to the agricultural communications profession. For example, what is the type and quality of the information being provided by veterinarians, the Internet, on television, or by county extension publications? What level of knowledge of agroterrorism or crisis planning do these individuals possess? If the typical beef producer from Oklahoma is looking toward these sources of information, should it be imperative to know to what level these sources are informed?

It may be interesting to investigate why beef producers cite the Internet as a preferred secondary source of information, but continually rate it as a neutrally trusted source. Are beef producers using the Internet to guide their knowledge seeking engagements with the local veterinarian, while remaining cautious or wary of the information found on the Internet?

Once beef producer’s agricultural crisis planning literacy level is assessed, an exploration of the types and quality of information found is essential to determine the information gap between what a beef producer receives and the level of uncertainty remaining.

A study by Okai (1986) showed the area extension specialist as a low ranked source of information by small-scale Missouri farmers. This study showed the opposite in reporting the area livestock specialist as a preferred source of information by Oklahoma beef producers.

Implications for Information Source Trust

Beef producers from Oklahoma view the local veterinarian as the most trusted and reliable source of information available. The County Extension agent, USDA, and local area livestock specialist are also viewed as trustworthy and reliable sources.

This finding’s implication reinforces the fact the veterinarian, county extension agent, USDA, and area livestock specialists are a vital channel for the dissemination of information to Oklahoma beef producers. This implication is important since it helps the beef cattle industry identify and document the opinion leaders of the group.

The final implication of the findings on trust involves not so much which sources beef producers trust and rely upon, but more importantly, who they do not. The findings show the Internet was found to be a neutral information source when it came to both trust and reliability. The importance

of this point, discussed above, is that the Internet was reported to be a secondary source of information to the veterinarian, but not seen as a highly trusted or reliable source of information.

If the USDA, county extension agents, and area livestock specialists are seen as trusted and reliable sources, and the Internet is not, why do beef producers report the Internet's usage so highly? Is it because the Internet is a medium available 24 hours per day with no office hours or scheduling problems? If so, then an exploration of the content found at frequented sites by beef producers is needed to ensure accurate and timely information.

How do the USDA, county extension agents, and area livestock specialists move upwards on the list of sources of information if they are so trusted? It may imply if beef producers trust the USDA, county extension agent, and area livestock specialists so much and use the Internet as an important source of information, there is an opportunity for these entities to deliver or disseminate information via the Internet to Oklahoma beef producers.

Recommendations for Future Research

Pre-crisis dissemination of information is imperative and effective preparation levels are dependent upon accurate information. Neulip and Grohskopf (2000) stated "communication satisfaction may be a part of communication competence, in that competent interactants may be especially adept at reducing uncertainty" (p. 74). It is suggested future research be conducted to determine how communication competence affects the communication satisfaction and uncertainty reduction of beef producers when seeking information about possible crisis events. This type of study may be used to correlate levels of communication competency with levels of perceived uncertainty or lack of information.

Based upon the findings regarding the identification of information sources, it is recommended content analysis research be completed to determine the quality and type of information being disseminated to this state's beef producers. Once information type and quality is identified, researchers can determine the information gap and adjust the quality level and type of information dissemination.

Through this study, the question of where beef producers seek information was identified. It is suggested researchers use this knowledge to identify what types of information Oklahoma beef producers are interested in learning from the identified sources of information. This information will provide an insight into the areas of uncertainty beef producers are seeking to reduce through preferred and trusted communication channels.

Recommendations for Practitioners

Primary sources of information, i.e. the veterinarian, USDA, county extension agents, and local livestock specialists, should maintain a well-informed breadth of knowledge about agroterrorism and the affects to the Oklahoma beef industry. While their preparedness levels should include knowledge for their own level of expertise, they should anticipate being sought for questions regarding preparedness on protection and bio-security issues from producers.

Since this study identified sources of information used by Oklahoma beef producers, it is suggested these sources of information be used to deliver information to the beef producer in a proactive manner, rather than simply waiting for the beef producer to seek information. This identification of preferred sources of information reinforces the need to reduce Riesenberg and Gor's (1989) suggested "communication gap stumbling block" between the extension service personnel and the farmer through effective information diffusion.

Past studies of farmers and other agriculturalists show the preference of both interpersonal and mass media methods of information diffusion (Riesenberg & Gor, 1989). This research allows practitioners to understand the preferred information needs of beef producers; thereby increasing the effectiveness of future communication efforts by disseminating information more directly to beef producers through these identified preferred sources.

Based upon the findings that the veterinarian, USDA, county extension agents, and area livestock specialists are the most trusted and reliable sources for Oklahoma beef producers, it is suggested these sources use combined efforts to disseminate information through the preferred channels of veterinarians, Internet Web sites, and television. More specifically, use combined knowledge from all trusted sources of information to support a multi-sourced Web site sponsored by these primary trusted sources for dissemination of information through the Internet to beef producers.

Recommendations for Educators

Frazier (1999) maintained for the future of education and information dissemination:

There is a clear need to develop effective educational programs for stimulating continued attention of congressional decision-makers, for alerting companies that may be perceived as infrastructure targets to terrorists, and for training first responders who will come into contact with affected people, pets, or livestock after an bioterrorism attack occurs. (p. 4)

Oklahoma State University finds itself at the fountainhead of this information. Three of the four primary sources identified by beef producers (veterinarians, county extension agents, and area livestock specialists) are trained and educated within the confines of the OSU system. The land-grant university mission of research, teaching, and extension are essential to the role of increasing the information levels and knowledge of students, employees, and the public.

It is recommended the agricultural communications profession seek to determine the levels of information veterinarians are receiving, both in school as well as through continuing education, to provide opportunities for veterinarians to realize the vital role they play as opinion leaders within the beef industry.

It is recommended the same manner of assessment be conducted to determine the most effective method for educating those members of the Oklahoma Cooperative Extension Service about their role as opinion leaders and providers of information to the beef industry. It is essential for extension personnel to realize their importance as highly respected sources of information to rural America (Martin, Omar, 1988; Richardson & Mustian, 1994; Buford, Bedeian, & Lindner, 1995).

Finally, in a study by Okai (1986), vocational agricultural instructors were reported as a low ranked source of information by small-scale Missouri farmers. It is recommended the state's agricultural education profession is assessed to determine its level of involvement in the dissemination of information to beef producers. Agricultural educators have an opportunity to educate youth in matters of potential threats to agriculture. This information dissemination to young adults may have the potential to increase the agricultural educator's position as a preferred source of information when students graduate and become working adults in society.

Keywords

agroterrorism, uncertainty reduction theory, crisis communications

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Agroterrorism and the Implications of Uncertainty Reduction Theory for Agricultural Communicators

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Abstract

As a consequence of various terrorist attacks on U.S. soil the vulnerability of American agriculture to an agro-terrorist attack has come into question. The objective of this paper is to view the threat of agroterrorism through the lens of uncertainty reduction theory and extend the original application of the theory from the realm of interpersonal communication to the mass communication level. We offer a brief overview of bioterrorism and agriculture and the general concepts of crisis communication and pre-crisis preparedness. We explain the relationship between the level of uncertainty and organizational crisis with the value of pre-crisis planning efforts. We show the importance of the agricultural communicator as a source of agricultural knowledge in the pre-crisis stage, which can contribute to reducing uncertainty following an agro-terrorist event.

Introduction

“A covert biological attack could be easily designed to cripple the poultry or livestock industry by simultaneously introducing three or four highly contagious, highly fatal animal diseases” (Watson, 1999, p. 161). Watson (1999) maintained “the United States is vitally dependent on its agriculture and livestock. We are dependent on plants for our staple crops (wheat, rice, corn, etc.), for fibers (e.g., cotton and flax), for wood, for vegetables, fruits, and luxury items such as tea and tobacco, and for many materials used in industry” (p. 159).

According to an article in *BEEF Magazine* (Peck, 2005), Radford Davis, assistant professor of public health in the Department of Veterinary Microbiology and Preventive Medicine at Iowa State University, maintains the result of a bioterrorism attack aimed at the food and fiber system has a less offensive appearance than an attack causing the deaths of humans. Others agree, as Davis noted, agricultural terrorism is more about crippling the economy than killing animals (Peck, 2005; Monke, 2005). According to Sheeran (2002) when thinking about bioterrorist scenarios, the general public usually thinks of human threats rather than potential terrorist targets of the food and fiber system. For those agencies and organizations involved in assessing the fallout from a crisis within American agriculture, determining if the event is a natural occurrence or the work of agroterrorism will be difficult (Frazier, 1999; Casagrande, 2000; Kohnen, 2000; and Foxell, 2003).

Foxell (2003) maintained the uses of agroterrorism range from small protesting groups making political statements to organized state or sub-state factions trying to cripple the government through covert warfare. According to Casagrande (2000) internationally obtained pathogens have the potential to cause severe damage to the food and fiber system when used by knowledgeable individuals or groups.

Historical accounts of disasters in the food and fiber industry can provide an idea of the level of damage a terrorist attack may inflict on U.S. Agriculture. Due to the absence or minutia of empirical data on actual terrorist attacks against agriculture, governmental bodies are required to speculate the possible effect of a terrorist attack on the food and fiber industry. These speculations are in “what if” terms for the outcomes of these potential areas of attack. Past history is considered, and by factoring new technology, possible vectors, methods of dispersion, and the availability of agents or toxins in the open market, governmental agencies can create “worse-case” scenarios that might be used in prevention planning. Frazier (1999) maintained previous incidents include plots to infect food at grocery stores, water supplies, food processing facilities; and false claims or hoaxes can reduce public confidence in the agricultural industry.

In our current state of affairs in the Middle East and Iraq, the possibility of terrorism against American agriculture has been discussed. Kosal and Anderson (2004) maintained Al-Qaeda materials and documents seized by U.S. troops in Afghanistan addressed the subject of agricultural terrorism. Information such as this can provide governmental entities an opportunity to speculate, with greater success, about possible terrorism events.

Objective

The objective of this paper was to synthesize research affecting the agricultural communication profession within the context of Berger and Callabrese’s (1975) Uncertainty Reduction Theory. Viewing this potential threat of agroterrorism through the lens of Uncertainty Reduction Theory will increase the boundaries of the original interpersonal communication application of the theory to an organizational and mass communication level of application. To do so, the following areas were reviewed: (1) a historical overview of bioterrorism and agriculture, (2) the concepts of agromovement, (3) general concepts of organizational crisis communication response and pre-crisis preparedness.

Procedures

To gather data to meet the objectives, a search was conducted through various sources: 1) Index/Database searches including Agricola, Proquest, ERIC Digest, and Proquest Digital Dissertations, 2) books pertaining to crisis communication, and 3) Internet searches regarding historical accounts and governmental responses to the subject. Articles were grouped under themes found in the literature: types of agents and history of usage, crisis communication response, and the implication of terrorism on the food and fiber industry. A review of literature regarding Uncertainty Reduction Theory extended through recent communication theory textbooks to the origins of the theory over 50 years ago. Key word searches included publications associated with *bioterrorism*, *agroterrorism*, *food and agricultural crises*, *crisis and risk communication*, *risk assessment*, *livestock transportation*, and *uncertainty reduction theory*.

Findings

Uncertainty Reduction Theory

As people interact and attempt to effectively communicate, one problematic issue is inherent to all situations: communication style and diversity. No two people communicate, read and understand, or organize in the same manner. According to Bradac (2001) humans naturally seek explanation and predictability with the world, and do so by attempting to reduce uncertainty. In the attempt to make sense of messages and their meanings, miscommunication can result.

During human interaction, internal questions begin to arise about personal expectancy, predict-

ability, and congruence. There are high levels of uncertainty; people begin wondering about unknown likes/dislikes, beliefs, perceptions, and the way they are being perceived by the other person (Berger, 1973, 1979, 1987, 1988; Wood, 2000; and Brashers, 2001). Unexpected answers or the absence of clarification to these questions lead to varying degrees of uncertainty.

Brashers (2001) maintained uncertainty is interpersonal; belief in one's own ability or cognitive level of deriving meaning may cause perceptions of uncertainty, which will cause the individual to be uncertain. Brashers further maintained people may either attempt to reduce uncertainty when it's found to be threatening or, at other times, they may feel some measure of hope or optimism with certain levels of uncertainty. Contextually, people use communication as a tool of reduction or even avoidance to manipulate uncertainty to suit their needs. Bradac (2001) stated "the attractive and good idea motivating this theory is that subjective uncertainty to some extent can explain and be explained by communication behavior" (pp. 470-471). Communication interaction becomes a medium for the public to determine the level of their personal needs for uncertainty.

Uncertainty reduction theory is described in the context or assumption of two people meeting as strangers, where each person is primarily concerned with increasing the level of predictability, thereby reducing uncertainty, in the understanding of both persons during the interaction (Berger & Calabrese, 1975). The researchers maintained this context or assumption is "consistent with Heider's (1958) notion that man seeks to "make sense" out of events he perceives in his environment" (Berger & Calabrese, 1975, p. 100).

Berger and Calabrese (1975) maintained uncertainty involves two components: first, recognizing the various ways a person might behave; and second, the process of explaining the other person's behavior retroactively.

In the first component, a person engages in the mental process of predicting behavior, only which can be effectively completed if uncertainty about that person is reduced enough for the prediction accuracy - prior to the interaction (Berger & Calabrese, 1975). Once uncertainty is reduced to the extent of determining plausible predictions of behavior of one interactant, the other interactant must then choose appropriate responses, from those available as alternatives, to the expected or predicted action or behavior (Berger & Calabrese, 1975).

The second component involves deriving meaning and understanding from one interactant's communication act retroactively, to form reasonable explanations of behavior (Berger & Calabrese, 1975). For any reasonable explanation or attribution to be chosen, the observer must engage in the problematic process of narrowing the choice from any number of plausible explanations or attributions for a particular communication act (Berger & Calabrese, 1975).

Berger and Calabrese (1975) maintained this vein of thought follows Hieder's (1958) early work on seminal attribution, as well as the later work on attribution formulation by Kelley (1967); Jones, et al. (1972); and Kelley (1973) who stated in our personal desires of predicting our own behavior and those around us, we casually create structures to explain our own behavior and the behavior of those around us.

It is important to ground this endeavor of communication behavior prediction and explanation through Berger and Calabrese's (1975) assertion "attribution theorists have been quick to point out that such predictions and explanations generally yield imperfect knowledge of us and others; however, it is significant that such imperfect knowledge does guide our total behavior toward others" (p. 101).

Berger and Calabrese (1975) with their seven axioms of uncertainty reduction, maintained un-

feelings, values, and behavior” (p.21). Gudykunst, Ting-Toomey, Sudweeks & Stewart, (1999) described a person’s ability to speculate as to the outcome of a situation as prediction, and explanation as “stating why something occurred” (p. 21).

Why Uncertainty Reduction Theory?

Goldsmith (2001) maintains the theory has withstood the test of time with continual interest, producing “a steady stream of literature examining the experience of uncertainty, the ways in which individuals respond to uncertainty, and the outcomes associated with uncertainty” (p. 514).

Boyle, et al. (2004) state “the core logic of uncertainty reduction theory remains strong: Individuals in uncertain situations are likely to feel discomfort, and information seeking is a viable solution to that discomfort in many contexts” (p. 157). Bradac (2001) stated “uncertainty reduction theory is clearly formulated, precisely demarcated, highly logical, and easily testable” (p. 470).

Berger and Calabrese’s axioms and theorems have been tested empirically (Sunnafrank, 1990), fostered a foundation for theory construction (Bradac, Bowers, & Courtright, 1980; Sunnafrank, 1986; Gudykunst, 1995; and Neuliep & Grohskopf, 2000), and supported an “accumulation of a substantial body of research” (Neuliep & Grohskopf, 2000, p. 67) as a “result of its longevity” (Bradac, 2001, p. 457). Goldsmith (2001) maintained “clearly, one of the greatest contributions of uncertainty reduction theory has been its heuristic value in directing our attention to the role of uncertainty in various communication situations and to practical concerns with how individuals manage uncertainty in problematic situations” (p. 514).

More importantly, researchers have continued the expansion of the theory past its interpersonal beginnings. For example, Goldsmith (2001) goes on to report the interest in uncertainty reduction theory expanded past its original parameters to include research in organizations, health care, and studies of intercultural interactions to uncertainty. Knobloch and Solomon (2002) maintained “the legacy of uncertainty reduction theory has implicitly guided assumptions about the focus of uncertainty, the function of uncertainty reduction, and the nature of information seeking” (p. 244).

Clearly, the two main components as described by Berger and Calabrese (1975), predictability and retroactive understanding, are two factors imbedded in the research of agroterrorism and its effect on crisis communication: terrorist acts are, by nature, unpredictable and due to the lack of empirical evidence, its is difficult to make sense of past acts in order to expand one’s ability or skill in terrorist behavior prediction.

Defining Bio/Agroterrorism

The Center for Disease Control defined bioterrorism as “the deliberate release of viruses, bacteria, or other germs (agents) used to cause illness or death in people, animals, or plants” (CDC, 2006). Sheehan (2002) defined biological warfare as the “use of a biological organism or biologically derived toxin or other substance to cause lethal or incapacitating effects; agents may be used to target humans, crops or livestock, or nonliving, but economically vital material, such as an oil supply” (p. 771).

Schaub (2002) defined agroterrorism as “the intentional or threatened use of viruses, bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals, or plants; or intentional or threatened use of chemicals against food or animals; or the intentional or threatened use of explosives to disrupt agriculture production or supplies of food; the purpose of the act or threat is to intimidate or coerce a government or civilian population” (p. 1). Deen (1999) maintained

“biological warfare threats still encompass denial of food supplies, but now includes economic objectives, primarily economic loss to the industry by restrictions on international trade and disruption of internal distribution by governmental efforts to isolate and eradicate the disease” (p. 164).

History of Bioterrorism and Agriculture

Even before humans discovered the principles of germ theory and disease, biological uses of organisms and toxins were used in warfare in the fourteenth century (Sheeran, 2002). Five-hundred years later, nineteenth century microbiological advances found the isolation and identification of disease-causing microorganisms a useful discovery in allowing them to be used with more specificity than using dead bodies to contaminate water supplies (Sheeran, 2002). “Historically, anti-plant and anti-animal agents were selected for widespread distribution, in a wartime situation, with the intent of killing or rendering unfit for their intended use” (Deen, 1999, p. 164).

“Extensive use of chemical weapons during World War I prompted the creation of the Geneva protocol of 1925, which called for the prohibition of the use in war of asphyxiating, poisonous or other gases, and of bacteriological methods of warfare” (Sheeran, 2002, p. 771). Sheeran (2002) maintained this protocol did not deny a state’s ability for research and development, production or storage of the weapons, only their use in warfare.

According to Casagrande (2000) history shows crop pests with the worst U.S. damage records were initially introduced by accident from international origins. Sequeira (1999) maintained U.S. history is full of various “anecdotes of the disastrous effects of invading diseases and insects. In 1904, an epidemic known as the “chestnut blight” caused by an Asian fungal agent, *Endothia parasitica*, resulted in the near extinction of the American chestnut” (p.49). Other examples include the nineteenth century introduction of the boll weevil (*Anthonomus grandis*), drastically affecting cotton production; or “multi-billion dollar threats posed by the Mediterranean fruit fly (*Ceratitis capitata*) and citrus canker (*Xanthomonas campestris*) to the fruit and vegetable production in several southern states; and the nearly completed campaign against wheat Karnal bunt (*Tilletia indica*)” (Sequeira, 1999, p. 49).

The bacteriological or viral contamination of livestock can cause a disruption of protein availability in the marketplace, as well as cause the need for the destruction or eradication of animals to prevent further spread of the infection or contaminated areas.

Agromovement: Livestock Movement and Concentration

To manage any disease outbreak, one great concern is transportation (Graham, as cited in Knowles, et al. 2005). Lane (2002) in sworn testimony to the U.S. Senate Committee on Bio-security and Agro-terrorism stated:

The agriculture industry is highly efficient, particularly in the movement of cattle. To meet the demands for beef products throughout the United States and the world, it has evolved into a ‘non-stop operation’ that requires constant, uninterrupted movement of live animals, feed supplies and finished product. “Agromovement” may represent the greatest vulnerability to the industry in preventing, planning for and responding to an agroterrorism event. Agromovement can best be defined as the continuous cycle of movement required in farm to fork food production, including all aspects of animal transportation to finished products destined for distribution and consumption throughout the world (n.p.)

According to Knowles, et al. (2005) a disruption, or even the potential interruption, of this system of animal movement will include subsequent economic repercussions, especially to the thousands of industry employees in the food supply chain. For example, Knowles, et al. maintains, in Kansas the impact of an outbreak of FMD could affect areas in southwest Kansas, bordering the I-35 corridor, containing “nearly 80% of the state’s processing capacity and 90% of the state’s feedlot cattle inventory” (p. 107).

Lane (2002) maintains effective agroterrorism prevention and response efforts should include regional and locally targeted attention to the impact to the local communities; and this focus should be coordinated nationally in order to reduce uncertainty and miscommunication. One national plan identified by the USDA to help ensure some control of the issue of cattle movement and to reduce the uncertainty of specific age and transportation history, is the formation of the National Animal Identification System (NAIS).

The USDA (2006) maintained due to the increasing amount of numerous foreign animal diseases, the ongoing threat to possible introductions of these foreign animal diseases through intentional means, and the detection of BSE in the U.S. have led to the creation of the NAIS. This system will allow health officials, at both state and federal levels, to a) make quick and timely identifications of potentially exposed livestock and poultry, b) identify all animals coming in contact with the suspected exposed animal within 48 hours, and c) create a system of rapid containment offering maximum protection to animal health in the U.S. (USDA, 2006).

Deen (1999) maintained better transportation and the need to lower costs per unit for increased profit margins have grown the need and trend for the concentration of individual farms. Murphy (1999) suggested this trend of concentration increases the likelihood of disease transmission due to the growing numbers of cattle populations within close proximity; this trend reduces the geographic area of the target and increases the magnitude of the virulence – but benefits the defense for the disease (Deen, 1999).

According to Casagrande (2000) only a few animals from any one of the nation’s major feedlots would need to be contaminated in order to infect nearly all of the entire U.S. cattle population. Casagrande (2000) maintains the centralized feeding, raising, shipping and processing advantages of the livestock industry is also the “Achilles heal;” making it relatively vulnerable to the introduction of a highly contagious disease through one animal, rather than a coordinated effort of mass contamination.

This issue of concentration poses new stress on mitigation processes of the crisis; once a disease is introduced into this system, locating the origin of the infected animal and all the animals with which it came in contact can be an insurmountable task; a task detrimental to containment and recovery (Casagrande, 2000).

Knowles, et al. (2005) maintained due to the trend of centralization, the marketing, feeding, and processing within the central plains region of Texas, Oklahoma, Kansas, Nebraska, and Colorado, an outbreak of FMD would become costly to the beef cattle industry. BEEF Magazine (2005) estimated FMD outbreak exercises, conducted by the USDA, have shown the spread of the disease to at least 39 states and the need to destroy up to 48 million animals; Kansas alone moves more than 500 truckloads of cattle per day.

Crisis Communication Response

Seeger, et al. (2003) maintained the inability to move through effective recovery after a crisis can be brought on by poor communication. Henry (2000) maintained being prepared is the first step. "Anticipate every possible crisis. Then develop a communications plan for each potential crisis. Be prepared to respond immediately; this is essential if one hopes to avoid a crisis or be able to manage one if the inevitable happens" (p.22).

Effective crisis management relies on the foundation of effective planning and communication before, during and after the incident (Fink, 1986; Henry, 2000; and Seeger, et al., 2003). The consideration of possible agroterrorism incidents could lead to the development of a system or protocol that can be implemented if an assumptive agroterrorism incident became reality.

Once the initial incident has surfaced and the crisis moves into the public view, the first public response is crucial. Wilson (2002) maintained what is done and how communication occurs in the first few minutes or first hours of a crisis may well shape public opinion for hours, days, weeks, and possibly forever. Organizations can benefit from the proper handling of a crisis, but to do so, it is imperative to maintain effective communication efforts (Ulmer & Sellnow, 2000).

Seeger, et al. (2003) further maintained organizations may inhibit the public's ability to effectively assess the potential harm and risk of a situation if the organization has failed to supply or support a healthy exchange of information. Lukaszewski (1987) maintained a crisis event draws an intensified media interest, thus the strategic response of an organization is to control or manage the flow of information.

Organizations are caught between two polar opposites when faced with the opportunity to provide information to a demanding public. On the side of assessing the legality of their openness, the organization is tempted to offer as little information as possible about the crisis to avoid increasing liability or culpability. By contrast, many public relations professionals suggest openness and a forthcoming attitude with information helps the organization minimize or avoid damage to its reputation (Newsom, et al., 1989; Pinsdorf, 1987)

Consideration of the public's need or want for information is vital to the decision-making process of information dissemination during a crisis. Seeger and Ulmer (2001) maintained "while immediate responses may not always be appropriate for all aspects of a crisis, leader sensitivity and responsiveness to the high levels of uncertainty faced by stakeholders is a praiseworthy virtue" (p. 374).

Theoretical Application to Agroterrorism

In its first postulation over 30 years ago, uncertainty reduction was applied to interpersonal communication relationships. Theorists have historically used this explanation as a method to explain the communication interaction between individuals, groups of people, and organizations. Recently, theorists have recognized its transcendence to other levels of communication; for example, Boyle, et al. (2004) maintains the theory's basic logic is applicable to mass communication research. "Mass communication can potentially serve as a source of uncertainty as well as a mechanism for information seeking... we expect that uncertainty arising from mass communication could lead to information seeking in a mass communication context" (Boyle, et al. 2004, p.157).

Thus, this theory may also be applied to larger events, such as an agroterrorism incident, when viewed from the perception of the individual experiencing the crisis and the communication interactions and information seeking with media and organizations in order to reduce the uncertainty and anxiety brought to bear through the crisis. Seeger, et al. (2003) stated "the public seeks information

to determine whether the crisis will affect them, how they should think, and what they should do” (p. 71). Boyle, et al. (2004) maintained through events covered through the media, such as a crisis, the public used current news coverage to seek ongoing information regarding the tragedy; this seeking of knowledge was key to reducing the discomfort associated with high levels of uncertainty in the days after 9/11. Gudykunst, et al. (1995) maintained this anxiety “is an affective response involving the feeling of being uneasy, tense, worried, or apprehensive about what might happen” (p. 21); Stephan and Stephan (1985) further stated “...this anxiety stems from the anticipation of negative consequences,” (p.159).

Gudykunst, et al. (1995), also maintains people have natural uncertainty thresholds, and by being above the maximum limits or below the minimum limits, cause people to feel uncomfortable and experience difficulties in attempting to communicate effectively. Gajduschek (2003) asserts by merely minimizing levels of uncertainty people greatly increase the ability to calculate and predict actions and outcomes.

Brashers (2001) maintained a belief in one’s own ability or cognitive level of deriving meaning may cause perceptions of uncertainty, which will cause the individual to be uncertain. Seeger, Sellnow, and Ulmer (2003) stated, “the public seeks information to determine whether the crisis will affect them, how they should think, and what they should do” (p. 71).

Seeger, Sellnow and Ulmer (2003) maintain there’s an inhibition of the public’s ability to effectively assess the potential harm and risk of a situation if an organization has failed to supply or support a healthy exchange of information. Therefore, the caveat for the field of agricultural communications is remembering the public’s ability to predict behavior is inherently affected by uncertainty, but, more importantly, if agricultural communicators fail to supply timely information, the problem is exacerbated.

Seeger, Sellnow and Ulmer (2003) go on to state, “uncertainty reduction enables organizations to diminish ambiguity, build consensual meaning, and coordinate efforts” (p.71). In an effort to reduce this uncertainty, effective communication between the public and media or an organization should contain enough information for the public to predict or derive possible plans of action to ensure personal safety, as well as the safety of their families and livestock in times of an agriculturally related crisis.

Conclusions and Recommendations

The threat of agroterrorism is real (Sequeira, 1999; Monke, 2005). Terrorists have the capability of disrupting the food supply or causing devastating effects to the animal production industry. These situations have the possibility of creating public chaos as individuals seek to preserve the livelihood and safety of their family and farms. Terrorists may use plant diseases to disrupt crop production through outright destruction or by simply affecting the outcome of harvest yields, causing food shortages. Animals are susceptible to diseases potentially causing death or disruption to reproduction capabilities, again, causing potential food shortages. Any disruption to the food supply chain, especially an interruption of animal transportation or product shipping, could have a devastating affect on food process from farm to fork and, at the very least, an economically devastating effect to production agriculture.

Terrorism to the food and fiber system, by creating sickness in food animals or humans, can create a heightened uncertainty regarding basic food choices. This ubiquitous uncertainty can be seen with the recent issue of salmonella contaminated tomatoes and the constant change in the weekly

advice from the government, as well as its ambiguous opinions on the safety of tomato consumption and the origin of the salmonella contamination.

This paper supports the Brown (1999) assertion that increasing awareness is our only defense to such events. Proper planning, through effective crisis communication efforts, has the capability of reducing individual stress or public chaos by providing information and guidelines to be followed or replicated by any person or group. However, with the amount of information available in the digital age, the uncertainty lies within the challenge of determining which sources of information are providing a correct account of the day's information and what portion of the information to believe. Ambiguous information can lead the public to question their knowledge about or their ability to understand or manage this new crisis information.

Agricultural communication professionals, who are readily positioned to provide information regarding agricultural issues, have the opportunity to reduce this miscommunication uncertainty and potentially alter the negative effects of a potential agroterrorism event. Agricultural communicators, by providing relevant and timely information to the public, will have an inherent impact on the public's ability to understand the scope of the crisis and assist those publics to effectively respond and recover from the incident. This work in the pre-crisis environment will allow agricultural communicators an opportunity to shape the way people and organizations manage their way through a crisis, once it's introduced. The potential savings of the pre-crisis planning and communication efforts not only save time but also reduce the resources expended to manage and recover from the crisis.

Recommendations for Future Research

The scope of information disruption caused by a crisis could be limited by having tested communication plans in place to assist in the management of a particular crisis. These effective agricultural communication plans could mean the difference between chaos and ordered preparedness. It is recommended future research be aimed at answering the following questions to create clarity in the field of crisis communication responses to agroterrorism events through effective agricultural communications research efforts:

What are the basic safety information requirements for society to protect individual health in the event of widespread food contamination? Researching answers to this question will lead studies down the various paths of information dissemination and communication channels, as well as research regarding the message content and framing to ensure shared meaning between the sender and receiver.

How could effective communication planning in county, state, and federal government levels aid in the prevention, handling, or management of a situation involving agroterrorism? While the immediate command and control response is vital to the successful management of a crisis, emergency planning must include the management of information before, during and after a crisis. While research regarding pre-crisis information source trust and reliability has been conducted (Ashlock, 2006), a further look into the content and usability of this information should be studied in order to determine its effectiveness in order to reduce uncertainty for stakeholder groups, from producers to consumers, as well as emergency response personnel.

What is the need for public education in the areas of hazard identification, prevention, or the remediation of the impact of an agroterrorism incident? Research should focus on studying the gap between what stakeholder groups need to know for a successful response to a crisis event and what those groups currently know or think they know. Research outcomes could assist agricultural communicators to create focused or strategic communication efforts in order to raise awareness regarding crisis

What educational materials should be developed to increase the awareness of agroterrorism on the secondary and post-secondary level? Although agricultural educators were not identified as a potential source of information (Ashlock, 2006), future research should assess the strategy of disseminating information regarding agriculturally related crises at a pre-college age through the use of the high school agriculture classroom. This research has the potential for educational and training efforts to be designed to ensure agricultural education professionals become local trustworthy and reliable sources of information during an agriculturally related crisis.

Keywords

agroterrorism, uncertainty reduction theory, crisis communications

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